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A view of Pisgab Lake at Atterbury Fish & Wildlife Area in Johnson County.

#### On the Cover: Bobcat

This year's annual report has a new name. It reflects the merger of the Wildlife Diversity Program and the Wildlife Research Program into a single Wildlife Science Unit. A bobcat (Lynx rufus) was chosen for the cover because the species provides an ideal perspective on the scope of conservation and management responsibilities of the Wildlife Diversity and Wildlife Research staff.

This elusive felid roamed throughout the state at the time of European settlement but its native populations later declined due to habitat loss and overexploitation. Bobcats became one of the first species to be listed as endangered by the Indiana Department of Natural Resources (DNR) in 1969. They began to receive attention in Indiana with the passage of the Nongame and Endangered Species Conservation Act of 1973, which authorized the DNR to develop programs to protect and manage rare species.

A decade later, nongame biologists began to systematically compile and analyze confirmed reports of bobcats throughout the state. Few had been reported in the 25 years after the bobcat's listing as endangered, but that trend started to change. Biologists began to see consistent and substantial increases in the number and distribution of confirmed bobcat sightings in Indiana. These observations prompted a 7-year study beginning in the late 1990s in which Wildlife Diversity staff tracked bobcats using radio-telemetry. More than 40 bobcats were radioed and much was learned about their movement patterns, habitat preference, sources of mortality, food babits, and reproductive biology. Based largely on these efforts, the bobcat's legal status in Indiana was downgraded in 2005 from endangered to special concern.

Populations have continued to rebound. In 2012, bobcats were removed from the state's list of special concern species; however, they remain protected. Responsibility for their future management has since transitioned to Wildlife Research staff. From a modest beginning more than 40 years ago, bobcats have benefitted from focused research and monitoring efforts carried out by professional wildlife biologists. Today, the prospects for Indiana's most elusive predator have never looked better, and careful stewardship of bobcats will continue under the Wildlife Science Unit. (Photo by Steve Gifford)

#### **Photograph Note**

Note: Wildlife Science Unit staff took many of the photos in this publication. Others were taken by DNR photographers Frank Oliver and John Maxwell or are in the public domain, unless otherwise noted.

### WILDLIFE DIVERSITY AND RESEARCH BIOLOGISTS MERGE TO CREATE WILDLIFE SCIENCE UNIT

In 2014, the Division of Fish & Wildlife (DFW), within the DNR, changed its organizational structure. One

of the outcomes was to unify the supervision of the Wildlife Diversity biologists and the Wildlife Research biologists under a single Wildlife Science Unit.

Although their mission, funding sources and focal species differ, the groups share the fundamental responsibility of conducting statewide monitoring, surveys and research. This new structure lends itself to a more holistic approach to wildlife research and management, and their roles in decision making.

As such, we have changed the Wildlife Diversity Annual Report in name and content to better reflect the breadth of projects undertaken by the Wildlife Science Unit. We have maintained the previous format to help readers understand the various funding sources and support the DFW relies upon to properly manage Indiana's wildlife resources.



Rather than a melodious song, a male ruffed grouse creates a drumming sound to attract a female, like the one pictured, by quickly rotating its wings forward and backward.

# **WILDLIFE DIVERSITY**

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#### RARE SPECIES CONSERVATION

State law charges the DNR with the management and conservation of nongame and endangered species, terms that can be confusing unless explicitly defined. Nongame refers to wild mammals, birds, reptiles, amphibians, fish, mollusks and crustaceans not normally pursued by people for food or commercial purposes. Endangered is defined as any animal species whose prospects for survival or recruitment within Indiana are in jeopardy and are in danger of disappearing from the state. This

designation includes all species classified as endangered by the federal government that occur in Indiana.

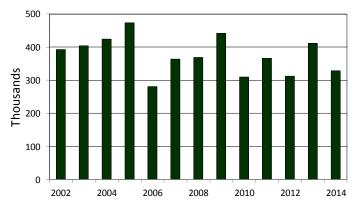
The DNR has established two categories to designate the legal status of rare species in the state: endangered and special concern. Special concern is defined as any animal species requiring monitoring because of known or suspected limited abundance or distribution, or because of a recent change in legal status or required habitat. Only species designated as endangered receive legal protection through the Indiana Nongame and Endangered Species Conservation Act (IC 14-22-34), which was passed in 1973.

Wildlife that is pursued as game is managed using hunting and fishing license fees and federal funds. In contrast, the conservation of nongame and endangered wildlife is supported by citizen donations to the Nongame Fund and, since 2000, federal matching funds (State Wildlife Grants, Endangered Species funds). These resources support a modern scientific program that uses survey and monitoring, research, and habitat management to protect Indiana's endangered wildlife. The Wildlife Diversity section of this 2014 Wildlife Science report includes information on the status of specific nongame and endangered species. Updates to contractual external projects can be found online at *IN.gov/dnr/fishwild/3347.htm*.

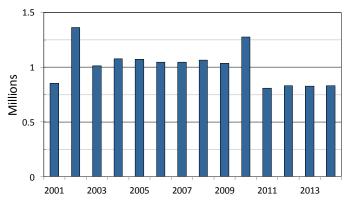
#### **FUNDING**

The DFW appreciates the continued support of Hoosiers who value wildlife diversity in the state.

Indiana citizens graciously donated \$329,112 to the Nongame Fund when filing their State income taxes in 2014. That is below the 13-year average of \$375,000 and a 20% decrease from the previous year. Fluctuations in contributions are unsettling but nothing new. They come with the territory when funding is based on voluntary donations rather than a dedicated source. The Nongame Fund supports Wildlife Diversity projects and provides the matching funds needed to receive federal grants.



Donations to the Nongame Fund from 2002 to 2014 in thousand-dollar increments.



Federal matching funds for the Nongame Fund received from 2001 to 2014 in millions of dollars.

The DFW received federal funds in 2014 through the State Wildlife Grant (SWG) Program. The amount received was similar to that of the previous year but below the long-term average of \$1 million. We are grateful to our many university partners who continue to provide the non-federal match needed to secure these funds.

Additional federal funds were received in 2014 from a competitive white-nose syndrome (WNS) grant (\$36,500) and a Section 6 endangered species grant (\$58,098). The WNS grant supports ongoing winter bat counts, analysis of cave microclimate data collected over the past two decades, and pays for staff travel expenses to attend national and regional WNS meetings. The endangered species grant will be used to assess the current distribution of the Eastern massasauga (Sistrurus catenatus) in Indiana. The massasauga is a federal candidate species. It is currently being reviewed for protection under the Federal Endangered Species Act. Information gained from this project will help guide management and recovery efforts.

All federal discretionary funding is uncertain at this time, including SWG funds slated for 2015. Uncertain funding and inadequate staffing are just some of the many challenges facing DFW staff. However, through the years the DFW has been blessed with great partners and loyal supporters. This is a team effort, and Indiana has the right pieces in place to work on preserving the state's rich wildlife diversity and heritage.

### RARE SPECIES STATUS— ASSESSMENT AND CHANGES

Information considered in determining the most appropriate designation for a species includes biological factors such as distribution, population size and trends, vulnerability and known or potential threats. Knowledge gained from the survey and monitoring activities described in this report provide valuable information in determining a species' status. Wildlife Diversity biologists also meet annually with Nongame Technical Advisory Committees to discuss new information and objectively evaluate potential changes. Public input is sought for

#### **HOW TO DONATE**



The Division of Fish & Wildlife invites you to play an active role in conserving Indiana's nongame and endangered wildlife. Wildlife Diversity projects are

funded through public donations to Indiana's Nongame Wildlife Fund. The money donated goes directly to the protection and management of more than 750 wildlife species in Indiana—from songbirds and salamanders to state-endangered Indiana bats and lake sturgeon. You can help Indiana's wildlife by looking for the eagle logo and the line provided on your Indiana state tax form to donate all or part of your refund. You may also donate online at endangeredwildlife. IN. gov or write to:

Nongame Fund 402 W. Washington St. Rm. W273 Indianapolis, IN 46204

proposed revisions that would add or remove a species' endangered status.

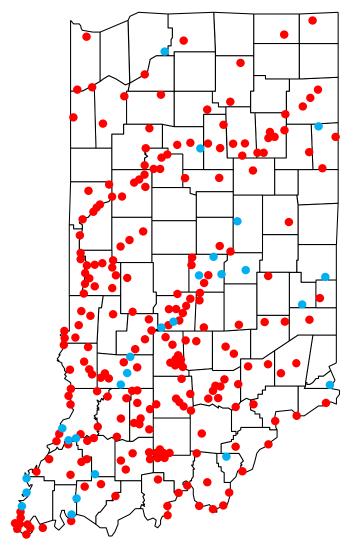
In 2014, no changes were made to the list of Indiana's endangered and special concern species, found at *endangeredwildlife.IN.gov*.

#### **SURVEY AND MONITORING**

Inventory is the critical first step in management planning. Working with rare or secretive species complicates identifying the starting point. Wildlife Diversity personnel conduct numerous surveys to determine a species' current status, (i.e., endangered, special concern or secure). Additionally, adaptive wildlife management activities and habitat alterations need to be evaluated for their potential impact on rare species. Through survey and monitoring, appropriate conservation actions can be determined and management refined to minimize adverse activities. To achieve the goal of maintaining Indiana's biological diversity, the status of species and habitats must be determined and conservation efforts prioritized.

# BIRDS Bald Eagle

Helicopter surveys to monitor bald eagle (Haliaeetus leucocephalus) nesting in Indiana were discontinued after 2010, but biologists still catalog new nest sites in the state. DFW property managers and the public bring newly discovered eagle nests to our attention. During the last comprehensive survey in 2010, 120 eagle pairs were known to be in Indiana, with approximately 20 new nests reported in 2011, another 35 in 2012, and 35 in 2013. In 2014, 28 new bald eagle nests were discovered, although a few were new nests in territories that



Previously known nests (red) and new nests discovered in 2014 (blue) for bald eagles in Indiana.

already had nests. Six nests represented new Indiana county records for Hancock, Madison, Fayette, Wayne, Vanderburgh, and Floyd counties. In recent times, bald eagle nesting has been documented in 77 of Indiana's 92 counties. The current population is likely around 200-250 breeding pairs.

Another way to monitor long-term eagle population trends in the region has been to conduct winter surveys. Nationwide mid-winter bald eagle surveys, now coordinated by the Army Corps of Engineers, have been conducted in Indiana since 1979. For many years, these were conducted by helicopter, but aerial surveys were discontinued after 2010. However, in January 2013 and again in 2014, an opportunity arose to accompany the waterfowl biologist during helicopter surveys on portions of the Ohio, Wabash and White rivers. Survey areas in 2014 were somewhat more limited with the Wabash River surveyed from Posey County to Terre Haute (Vigo County) and the West Fork of the White River in Owen and portions of Morgan and Greene counties. Gibson Lake and Turtle Creek Reservoir were also counted via

air. Ten other locations, mainly mainly fish and wildlife area (FWA) properties or public lakes, were surveyed for eagles from the ground. Overall, 298 bald eagles were tallied at these sites. At the nine sites surveyed from the ground in both of the past two years, 133 bald eagles were counted, compared to 157 in 2013. Eight sites were 32% below the previous 10-year average of 100 birds. Of the river segments surveyed by air, 147 bald eagles were counted in 2014, compared to 52 in 2013 and the 10-year average of 29 birds. Cold weather at the time of the survey resulted in most lakes being mostly frozen over. Even many river segments had ice flows and frozen sections. Exceptionally high numbers of waterfowl were concentrated in river channels as a result of adjacent fields being frozen. Among the individual counts, greatest concentrations of eagles were observed at a night roost along the Mississinewa River (65 eagles), the Sugar Creek night roost (20), Monroe Lake (27), and the Wabash River in Knox (47), Sullivan (27) and Posey (24) counties.

After dramatic population declines following World War II, primarily from the devastating effects of DDT and other pesticides, our national symbol was declared recovered in 2007 and removed from the federal endangered species list. Indiana followed suit in 2008 after reaching a goal of 50 nesting pairs. This was a remarkable achievement considering that no eagles were known to have nested in the state from about 1900–1988. Restoration efforts from 1985–1989, when 73 eaglets from Wisconsin and Alaska were raised and released at Monroe Lake contributed greatly to the statewide recovery.

#### Barn owl

Barn owls (*Tyto alba*) are ghostly pale with whitish underparts and buffy, light-brown upperparts. They have black eyes and a heart-shaped face. Some people call them "monkey-faced owls." Barn owls are nocturnal. They feed at night on voles and mice. They never hoot, but instead give eerie, raspy calls.

Barn owls are rare in Indiana, primarily due to habitat



A barn owl leaves its nest box in Perry County.

loss. To find food, they need open areas of permanent grassland such as pastures, hayfields, prairies and the margins of wetlands. Nesting sites include cavities in large trees and human structures like haylofts, steeples, silos and other buildings.

In an effort to provide nesting sites more secure from raccoons (*Procyon lotor*) and other predators, the DNR has built more than 300 nest boxes and erected them in barns and other structures in suitable habitat statewide during the past three decades. Although many of these structures have been destroyed, existing boxes are checked periodically, and new ones are erected.

During winter 2013–14, a total of 157 barn owl nest boxes across the state were checked, cleaned out and otherwise maintained. Evidence of nesting during the previous season was found at 18 sites in 13 counties (Daviess, Dubois, Greene, Jackson, Jennings, Lawrence, Orange, Perry, Scott, Spencer, Switzerland, Vigo and Warrick). In addition, 19 sites had evidence of old nests from 2010–12 (but not 2013), and 10 barns had signs of owls roosting but not nesting. Fifteen new nest boxes were installed with the cooperation of private land owners, but 20 potential nest sites were found to be lost since the last site survey in 2009.

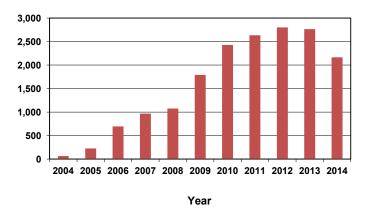
In spring 2014, Wildlife Diversity biologists placed a webcam inside an active barn owl nest in southern Indiana. The camera was outfitted with infrared, and there was much anticipation around the public's ability to watch the owls raise their young. The results were disappointing. The nest failed during the egg-laying phase after both adults left the nest and did not return. The reason is unknown.

Wildlife Diversity biologists are seeking reports of barn owls, especially reports of nesting barn owls. When biologists place a nesting box for owls in a barn or other building, owls can raise more young and are safer from predators.

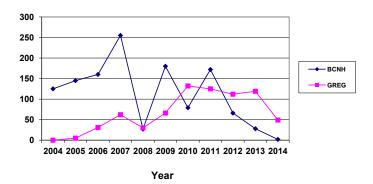
Barn owl populations in Indiana remain relatively rare but stable. They are primarily found in southern counties. Their numbers are restricted by the availability of grassland-type habitat, suitable nest sites, winter severity and predation by great horned owls and raccoons.

#### **Colonial Waterbirds**

The term "colonial waterbirds" refers to a number of different bird groups that nest in proximity to each other. In Indiana, these include cormorants, herons, egrets, terns and gulls. Two large gull colonies along Lake Michigan have been assessed periodically as part of the Great Lakes Colonial Waterbird Survey. Nests were last counted in 2011 with tallies of 9,517 ring-billed gull (*Larus delawarensis*) and 205 herring gull (*Larus argentatus*) nests at ArcelorMittal Steel West, and 23,899 ring-billed and 28 herring gull nests at ArcelorMittal Steel East. Colonies of great egrets (*Ardea alba*) and black-crowned night-herons (*Nycticorax nycticorax*) are counted annually at these sites along with double-crested cormorants (*Phalacrocorax auritus*), which are present at the eastern location.



Annual number of double-crested cormorant nests at the ArcelorMittal Steel plant in Lake County from 2004 to 2014.



Annual number of black-crowned night-beron (BCNH) and great egret (GREG) nests at the ArcelorMittal Steel plant in Lake County from 2004 to 2014.

The black-crowned night-heron is state-endangered and the great egret is listed as special concern in Indiana. Double-crested cormorants are viewed with some concern in the Midwest because increasing populations pose a potential threat to local fisheries, and they can compete for nest sites with less common heron and egret species.

This year's surveys of these birds were conducted on May 19. At ArcelorMittal Steel West, nesting cormorants have yet to be found, and black-crowned night-herons used to have a thriving colony in the 1990s until beavers destroyed virtually all the trees used for nesting. Regrowth has occurred and night-herons and great egrets now nest at this site along the Indiana Harbor at Lake Michigan. Black-crowned night-heron nests numbered 30, fewer than half the number found in 2013 (72 nests). The number of great egret nests (50) was greater than the 41 nests found in 2013. Great egret nesting was first observed at this site in 2009. All nests were in trees or shrubs except for one ground nest of a black-crowned night-heron. This colony is adjacent to a large breeding gull colony.

At ArcelorMittal Steel East, numbers of double-crested cormorants declined for the first time since counts began in 2004. Only 2,166 cormorant nests were counted, a 22% decline from the 2,764 tallied in 2013. Great egret numbers also declined in 2014. Only 49 were present, a 59% decline



A great egret stands on its nest at a colony in East Chicago.

from the 119 nests found in 2013. This marked the first time in the last five years that numbers have fallen below 100. Only two black-crowned night-heron nests were discovered, continuing the decline of this species at this site. In 2013, 28 black-crowned night-heron nests were tallied. The maximum count at this site was 255 nests in 2007.

These three species of waterbirds segregate themselves somewhat in the nesting colony. Double-crested cormorants nest closest to the Lake Michigan shoreline. Great egrets mainly use the few remaining trees that are farther from shore. Black-crowned night-herons will nest in shrubs or the lower portions of trees used by great egrets, but many of their nests are on rocks along the perimeter of two small impoundments at this site and adjacent to gull nests. At most nesting locations, all three species prefer to nest in trees and shrubs, but at this site beaver activity and the accumulation of cormorant guano have eliminated most woody vegetation. All great egret nests found were in trees or shrubs, while both night-heron nests were on the ground, along with 98% of the double-crested cormorants. Ground-nesting birds are relatively safe at this site because it is protected from most mammalian predators by Lake Michigan and heavy industry on the remaining sides.

Although gull nests were not counted at this site, nesting by ring-billed gulls was virtually absent. Normally, more than 10,000 nests are found at this location. Herring gulls seemed to be nesting in normal numbers (25–50 nests).

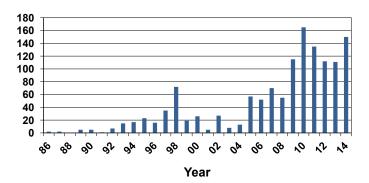
Continued monitoring at these sites will be used to guide management decisions regarding the need to control double-crested cormorants. A graduate student from Northern Illinois University is studying the diets of cormorants at this site to gain insight on the impacts they might have to Lake Michigan fisheries.

#### **Least Tern**

As ground-nesting birds found along major rivers, interior least terns (Sternula antillarum) are greatly influenced

by water levels. They feed on small fish and aquatic invertebrates, and benefit from the protection of water surrounding islands or river bars, which make their ground nests less accessible to ground predators. However, high river levels reduce the amount of suitable area available for nesting, and heavy rains can flood nests and result in losses of eggs and chicks or cause abandonment.

As in most years, water levels in southwestern Indiana along the Wabash and Ohio rivers were relatively high and offered few sandbars or islands suitable for nesting. High water levels in key nesting areas along the Mississippi River during the early part of the nesting season generally result in least terns venturing north to Indiana searching for nesting sites. The number of adult least terns at Gibson Lake in 2014 was 210, the fourthhighest count since this site has been monitored. At the American Electric Power (AEP) Rockport Plant in Spencer County, 30 adults were noted. Four adults returned to Goose Pond FWA in Greene County, where one pair nested on an island designed for them. At least two of the three eggs hatched, but there was no indication that they survived to fledging age. During 2014, a new nesting site was discovered in Gibson County, about 16



Annual number of least tern fledglings at Gibson Lake from 1986 to 2014.



Two least tern chicks and one egg pipping in their nest at Goose Pond FWA in July.

miles east of the Gibson Lake complex. Called Wheeling Bottoms, the property owned by Peabody Coal Company was populated by 30 adults that produced about 15 young. State and federal biologists met with company officials to discuss management options.

Working closely with Duke Energy, AEP and the U.S. Fish and Wildlife Service (USFWS), least tern colonies at the two main nesting locations are closely monitored, and steps are taken to ensure successful nesting. The Gibson County colonies nest on property owned and managed by Duke Energy, the USFWS (Cane Ridge Wildlife Management Area), and the Indiana DNR (Tern Bar Slough Wildlife Diversity Area).

The first least terns reported in Indiana during 2014 were noted at Gibson Lake on May 7. The birds remained until August 24. An estimated 135 nests produced a conservative estimate of 150 chicks fledged, the secondhighest number ever recorded here. Eighty-seven nests were found during the early part of the breeding season. Another 48 were tallied later, the result of pairs re-nesting after failed attempts and birds showing up from other parts of their range. The relatively few numbers of later nests suggest low levels of predation and other sources of nest failure this year. More than half of all nests and young produced were on the center dike of Gibson Lake (75 nests). The remainder was at Cane Ridge (40) and a coal ash disposal area (20). No nesting occurred at Tern Bar Slough, although least terns were seen foraging and loafing there. Pump problems again limited water levels at Cane Ridge and left the Tern Bar Slough nesting islands with no protective moat for most of the season.

At the AEP Rockport plant in Spencer County, an electric fence was again in place around the main nesting site in an effort to reduce predation by mammals and prevent Canada geese (*Branta canadensis maxima*) from loafing on the dike. At least 17 young were produced from 25 nests found. This location is along the Ohio River about 50 miles southeast of the Gibson Lake colony, and least terns have been present since 2003. The nesting site is a short, narrow dike separating some retention ponds. A nearby dredge island in the Ohio River sometimes has nesting terns, but few birds were seen this year due to high water levels.

Management of least terns, a federal- and state-endangered species, is challenging. It consists of maintaining nesting sites free of dense vegetation, using fencing and manipulating water levels to deter ground predators and employing least tern decoys to attract birds to suitable sites. These efforts have resulted in more than adequate production in eight out of the last nine years and a steadily increasing number of least terns in Indiana since their discovery in 1986.

#### Loggerhead Shrike

The loggerhead shrike (Lanius ludovicianus) is a songbird slightly smaller than a robin. Its striking appearance includes a broad black mask through the eyes, a gray back and breast, a white spot on black wings, and white edges on a black tail.

Shrikes have a strong, hooked bill with which they can



The unique combination of colored bands on the legs of this loggerhead shrike in Orange County identifies bim for tracking.

take prey items that are large compared to the shrike's size. Because shrikes lack the strong talons of raptors, they instead hang their prey from thorns or barbed wire to provide an anchor while they convert their prey into bite-sized pieces. They also conveniently store prey they hang in this manner.

Shrikes have a diverse diet which includes beetles, grasshoppers, wasps, spiders, mice, voles, house sparrows, snakes and frogs. They hunt from perches, scanning the ground from a utility wire, post, fence or plant stalk to pounce on prey below.

Habitat for loggerhead shrikes consists of grasslands, deserts, shrub lands and agricultural areas. Shrikes prefer fence lines and livestock pastures with short vegetation and smaller fields planted with a variety of crops bordered by shrubby hedgerows. Nests are substantial structures of small twigs and grass that are lined with horse hair or wool and placed in a shrub or small tree. Eastern red cedars and multiflora rose bushes are favorite nesting sites in Indiana, especially when the bush is isolated within a fencerow. Shrikes sometimes nest twice in one season, especially if the first nesting attempt fails.

Loggerhead shrikes have been undergoing substantial population declines in the eastern United States and are a state-endangered bird in Indiana and many other states. Reasons for this are puzzling. They likely include a combination of factors such as the loss of quality breeding habitat, the use of pesticides, and increasing human development on their wintering grounds in the southern United States. Loggerhead shrikes were included on Indiana's state-endangered list when it was created in 1981, and they remain there today.

In 1999–2000, Wildlife Diversity biologists did extensive surveying for shrikes. They found 58 territories in 1999 and 45 territories in 2000. In the years since, shrikes have shown a dramatic decline. Statewide, fewer than 10 nesting territories have been found annually since yearly surveys began in 2010.

Biologists have conducted surveys in areas with historical shrike nesting territories every spring and summer since 2010. Nearly all nests found in recent years have been on or adjacent to traditional Amish farms. In 2014, eight nesting territories were located in Daviess (three), Gibson (one), LaGrange (two), and Orange (two) counties and monitored during breeding season. Eleven nests were found and six nestling shrikes were banded. Two additional juvenile birds were found after they had already left their nest.

Four nests successfully fledged young (33%), five nesting attempts failed due to suspected nest predation (42%), and one nest was lost when the fencerow containing the nest bush was cleared (8%). Nesting outcome could not be determined at three nests (25%). Numbers of shrike territories have remained steady since 2010, suggesting the Indiana shrike population is stable but vulnerable.

In 2014, as part of a collaboration with other states and Canada, five shrikes were fitted with unique colorband combinations and feathers were collected for genetic analysis. Reported sightings of banded shrikes will help biologists answer important questions about this declining species. Topics include where shrikes migrate and winter, how long they live, their territory size and fidelity, and their genetic exchange across populations.

#### Marshbird surveys

Marshbirds consist of diverse birds from different groups. The term comprises bitterns, rails, gallinules and grebes. These birds are difficult to survey. They reside in dense emergent vegetation and are inconsistently vocal during breeding season. Thus, little is known about their numbers, population trends, and responses to habitat changes and land management practices.

A standardized protocol using playbacks of vocaliza-

tions has been developed and is used throughout North America. In Indiana, short-term surveys employing that protocol have been used primarily to learn about the distribution and relative abundance of marshbirds. In 2010, the Indiana office of the National Audubon Society set up survey points at 8,000-acre Goose Pond FWA in Greene County. This expansive mix of shallow wetlands, ditches and upland grasslands provides extensive habitat for rails and bitterns.

In 2012, the DFW overtook administration of the Goose Pond surveys and set up additional routes at 840-acre Tern Bar Slough Wildlife Diversity Area in Gibson County. These surveys sought to determine the relative density of rail and bittern species and study how diversity and populations change over time.

In 2014, state agency staff and volunteers again surveyed 26 points along eight routes at Goose Pond. The Tern Bar Slough site had two routes and nine points. Surveys were conducted during three two-week time periods from mid-April through May. Target species recorded during surveys were American bittern (Botaurus lentiginosus), least bittern (Ixobrychus exilis), king rail (Rallus elegans), Virginia rail (Rallus limicola), and sora (Porzana carolina). Non-target species included piedbilled grebe (Podilymbus podiceps), common gallinule (Gallinula galeata), American coot (Fulica americana), Wilson's snipe (Gallinago delicata), sedge wren (Cistothorus platensis), marsh wren (Cistothorus palustris), and swamp sparrow (Melospiza georgiana).

A total of 146 unique detections of target species were logged in 2014. Sora and American bittern were the most common species detected at both locations. Sora and Virginia rails are mostly migrants in southern Indiana. Bittern species and king rails regularly breed. All species, except least bittern, are more commonly detected on earlier surveys due to timing of migration

	Sur			
	April	May	May	
	15-30	1-14	15-31	Total
Goose Pond FWA				
No. points	26	26	35	87
American bittern	7	7	6	20
Least bittern		4	2	6
Sora	39	45	2	86
Virginia rail	2	1		3
King rail			2	2
Tern Bar Slough				
No. points	9	9	9	27
American bittern	1	2	2	5
Sora	13	7	1	21
Virginia rail	2			2
King rail			1	1

Number of birds detected during 2014 marshbird surveys.

	Sur			
	April	May	May	
	15-30	1-14	15-31	Total
Goose Pond FWA				
No. points	26	26	35	87
American bittern	0.27	0.27	0.17	0.23
Least bittern	0.00	0.15	0.06	0.07
Sora	1.50 1.73		0.06	0.99
Virginia rail	0.08	0.04	0.00	0.03
King rail	0.00	0.00	0.06	0.02
Tern Bar Slough				
No. points	9	9	9	27
American bittern	0.11	0.22	0.22	0.19
Sora	1.44	0.78	0.11	0.78
Virginia rail	0.22	0.00	0.00	0.07
King rail	0.00	0.00	0.11	0.04

Number of birds detected per survey point during 2014 marshbird surveys.

and higher calling frequencies before egg-laying. All the rail and bittern species except sora are on Indiana's list of endangered species. Marshes and other wetlands have been destroyed or degraded over the years, and quality wetlands are difficult to find. Marshbird surveys at restorations such as Goose Pond and Tern Bar Slough demonstrate that wetland birds will readily discover and use these habitats.

#### **Osprey**

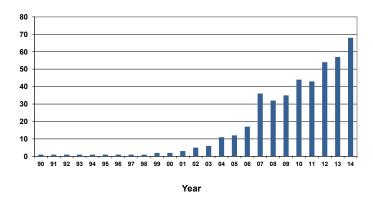
A restoration effort was undertaken for this state-endangered bird from 2003–06. A total of 96 young ospreys (Pandion baliaetus) were taken from nests in coastal areas of Virginia and raised and released at four locations in Indiana. As a result of this effort and the erection of nesting platforms in a partnership between the Indiana DNR and private groups and individuals, Indiana's osprey population has shown steady growth. The goal is to sustain a population of 50 pairs. Osprey numbers are such that the bird will be considered for

Locations of osprey pairs or nests in Indiana in 2014.

removal from the Indiana list of endangered species in the near future.

Ospreys are large, eagle-like birds that are fascinating to watch. They are most commonly seen during spring and fall migrations while hovering, diving and catching fish in the open waters of Indiana's lakes, ponds and rivers. Historically, a few remained in the state, building large stick nests in dead trees near shorelines or on islands in lakes, rivers or wetlands. Now, osprey nests are most often found on man-made structures, including utility poles, cell towers, and especially nesting platforms built specifically for them.

Monitoring efforts for osprey continued in Indiana during 2014 with 85 sites checked. This figure included previous nests, nesting platforms, and locations with reports of new nests. Nesting appeared to have been delayed by a couple of weeks this spring, but nest success was above normal. Eleven new nests were found this year, including first county records for Fulton, Hamilton, Clark and DeKalb counties. Overall, 68 sites had osprey or osprey nests present (compared to 57 in 2013), with 59 (51 in 2013) pairs believed to have laid eggs, of which 53 (47 in 2013) were thought to be successful. At least 96 (82 in 2013) chicks were produced, but that is a



Annual number of osprey territories in Indiana from 1990 to 2014.



An osprey brings a fish back to the nest to two chicks and his mate. (Photo by Rich Clark)

significant underestimate because it is difficult to observe all young in the nest from the ground.

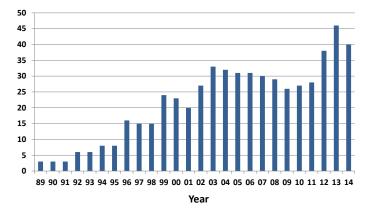
The distribution of ospreys is clustered in Indiana and includes 22 counties, with the largest number of nests in St. Joseph (12 nests or pairs), Orange (8), Kosciusko (8), Steuben (6), and LaGrange (5) counties. Public areas with the largest concentrations of osprey nests are Patoka Lake, Pigeon River FWA, Potato Creek State Park and Brookville Lake. Nests in 2014 were built on nesting platforms (23), communication towers (21), utility towers or poles (16), dead trees (6), a grain silo (1) and an abandoned crane (1). As communication towers have become increasingly used by ospreys, companies that service the equipment are encountering and recognizing osprey nests. Many contact the DFW for guidance. Most companies are willing and able to delay maintenance on the towers until after nesting season. Although vacant nests can be removed from towers without a permit, companies are encouraged to maintain at least part of the nest structure at a location on the tower where it is less likely to interfere with the tower's operation.

The outlook for ospreys in Indiana is promising as long as unpolluted waterways, healthy fish populations and suitable nest sites exist. For the third consecutive year, the number of osprey pairs has exceeded the recovery goal of 50, setting the stage for possible delisting in 2015.

#### **Peregrine Falcon**

In late 2013, the peregrine falcon (Falco peregrinus) was removed from the state list of endangered species. It is now considered a species of special concern. Indiana administrative rule changes now allow falconers to trap an unbanded juvenile peregrine in fall (September 20–October 20) to use for falconry. In 2014, only one bird can be taken in Indiana, and only 12 falcons can be captured in the entire Mississippi Flyway. Peregrine falcons taken by falconers will most likely be migrants from populations breeding in Arctic regions.

Breeding by peregrine falcons in Indiana during 2014 resembled that of the previous two years. Nesting occurred for the first time at a nest box on a smokestack at a power plant along the Ohio River in Lawrenceburg.



Annual number of peregrine falcon chicks fledged in Indiana from 1989 to 2014.



Two peregrine falcon chicks back in their nest box in New Albany after receiving unique color-number hands.



A female peregrine falcon in Fort Wayne keeps a close eye on biologists as they return her chicks to the nest box after banding.

One site omitted this year was the Milton/Madison bridge location because the nest box was moved back to the Kentucky side of the Ohio.

Overall, 21 locations had peregrines present during part of the nesting season, 16 nesting attempts were documented, 13 were successful; 43 chicks were banded, and 40 made it to flight stage. Four chicks were reported dead after taking their first flight. A 9-year-old female that had nested at a U.S. Steel site in Gary was found dead just before the breeding season. She was likely killed by a female who had nested at an adjacent territory and claimed the new site. Another female of similar age was found dead in South Bend during winter. One female died battling another for its open spot. The survivor nested successfully, was found injured in late June, and later died. In downtown Indianapolis, the breeding

male disappeared by late June and was replaced by the 2-year-old son of the resident female.

All chicks at all sites were banded this year, and six unhatched eggs were collected. No signs of trichomoniasis were detected visually in any chicks. Trichomoniasis, sometimes called "frounce" in falcons, is an upper digestive tract disease that is often fatal in young birds.

Because many young falcons are banded in the nest each year, much is known about them. Of the adults in the 16 territories where eggs were laid during 2014, 11 were unbanded, 14 were identified by their leg bands, and 5 had leg bands but their origins could not be determined. The remaining two birds were not observed well enough to identify.

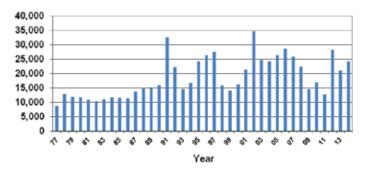
Identified adults had origins in six different states: Indiana (4), Wisconsin (3), Kentucky (2), Michigan (2), Illinois (1), and Ohio (1). One other adult had been initially captured and banded as an adult at its breeding site in Indiana, so its origin is unknown. For the first time in 26 years, all known breeding adults had been produced in the wild. At least three falcons nested for the first time, including an unbanded juvenile. Ages of females ranged from 1–16 years of age, while males ranged from 2–7 years old. Two long-time females that bred in 2013 died or did not show up to breed this year. They would have been 13 and 15 years old in 2014.

The 21 territories in Indiana are unevenly distributed around the state. Most peregrine territories are close to a large body of water. Indiana's nesting pairs were found near Lake Michigan (10 pairs), the Ohio River (3), White River (3), Wabash River (1), St. Joseph River (1), Kankakee River (1), and the three rivers of Fort Wayne (St. Mary's, Maumee, St. Joseph). Six nests are in downtown urban areas (five on office buildings, one on a bridge) and the remainder in industrial areas: power plants (7), steel mills (5), an oil refinery, a lime plant, and a grain elevator. All but one nest was in a nest box. Ten nests were on buildings and six were on smokestacks.

Indiana's healthy population continues to grow slowly and reflects the trend in the Midwest where more than 300 pairs are now present. That figure is several times greater than the 60-80 pairs estimated to have been present historically.

#### Sandhill Crane

The sandhill crane (*Grus canadensis*) is a long-legged, long-necked waterbird that can be confused with the similar-appearing but totally unrelated great blue heron (*Ardea herodias*), which is sometimes inappropriately referred to as the blue crane. Sandhills fly with their necks outstretched and are seldom seen alone—an individual is almost always in company of its mate, family group, or flocks numbering from a couple of dozen to the hundreds. During fall and spring migrations, groups of 50–100 are most commonly encountered flying in a loose V-formation, circling as they catch updrafts, or descending into a field to feed or roost for the night. During migration, their bugling calls are most often heard before the flock is sighted. The



Annual peak numbers of sandhill cranes counted during fall surveys at Jasper-Pulaski FWA.

Eastern population nests in marshes in the upper Great Lake states and southern Canada, and the population has been expanding. Nesting has been noted in Indiana since the early 1980s. It now occurs in the northern quarter of the state. Sandhill cranes feed on a variety of aquatic plants, invertebrates and small vertebrates, as well as waste grains in agricultural fields. At night, they normally roost in shallow water of marshes or fields.

Each year, the USFWS coordinates a fall survey of the Eastern population of sandhill cranes to monitor changes in population size. Much of the population stops at Jasper-Pulaski FWA in northwestern Indiana before venturing south to wintering areas in Tennessee, Georgia and Florida. Public properties and other areas with a history of stopovers by sandhill cranes were surveyed, while bird watchers were also asked to report sightings of cranes on the target survey date of October 29. Jasper-Pulaski FWA had 8,445 sandhill cranes present with lesser numbers at Pigeon River FWA (687), Kingsbury FWA (545), Tri-County FWA (20), and Willow Slough FWA (6). No cranes were observed at more southerly areas: Atterbury FWA, Goose Pond FWA, Brookville Lake, Ewing Bottoms in Jackson County or Monroe Lake. Many sandhill cranes had not yet moved south into Indiana from Wisconsin, Michigan and other Northern locales. Numbers on weekly counts at Jasper-Pulaski exceeded 7,000 birds from late October to early December, with more than 10,000 cranes counted from November to early December. The peak of 21,074 cranes was observed on November 26. This number is comparable to the previous 10-year average peak count of 22,412 sandhill cranes at Jasper-Pulaski.

### FISH AND FRESHWATER MUSSELS Lake Sturgeon Monitoring in the East Fork White River

Lake sturgeon (Acipenser fulvescens), a state-endangered fish species, once inhabited all the large rivers in the Ohio River drainage of Indiana. It is now, for the most part, only found in a small stretch of the East Fork White River. Lake sturgeon are, however, still reproducing, and the population seems stable. This population is the only Ohio River strain of lake sturgeon remaining in the entire Ohio River drainage.



East Fork White River at Williams Dam during more normal flows.



An egg mat is used to collect lake sturgeon eggs.



East Fork White River at Williams Dam just before lake sturgeon spawning. The river was more than 5 feet above flood stage.



A close-up photo of fish eggs on an egg mat. The larger, darker-yellow eggs are lake sturgeon. The smaller, lighter-yellow eggs are blue sucker.

Several lake sturgeon from the East Fork White River have been fitted with radio tags over the years to learn about their movements. Tracked lake sturgeon have shown similar annual movement patterns since the telemetry study began. Little movement occurs during winter. In spring, when water temperatures reach about 50° F, lake sturgeon participating in the year's spawning activities make an impulsive move upstream until their migration is blocked by Williams Dam. Lake sturgeon remain in the Williams Dam area until water temperatures approach 60° F, at which point they spawn. Once spawning ends, lake sturgeon redistribute downstream (often to the same location from which they started) where they spend the summer until the next year's spawning migration. Currently, six lake sturgeon with radio tags are being tracked in the East Fork White River.

During the first week of April 2014, five of the six lake sturgeon with transmitters moved upstream to Williams Dam. One fish remained downstream of Shoals the entire month and presumably did not spawn this year. It did travel to Williams Dam in 2013 and is likely a female. Female lake sturgeon rarely spawn every year. Lake sturgeon movement to Williams Dam coincided with a large flood and warming temperatures.

For the past several years, egg mats (cinder blocks wrapped in thick filter material) have been placed on the river bottom downstream of Williams Dam to pinpoint the date that spawning occurs. Placing egg mats was difficult in 2014 because the river level was 5 feet above flood stage. Two mats were placed on April 10 and had lake sturgeon eggs on April 11. Water temperatures rose from below 53° F to above 57° F during this time. By the afternoon of April 12, all five lake sturgeon

were at least 2 miles downstream of Williams Dam. One was almost to Shoals (more than 20 miles downstream).

Lake sturgeon eggs collected from the egg mats and procured from rocks along the river edge were taken on April 12 to the Cikana State Fish Hatchery. DFW fisheries personnel transferred them to the hatchery facilities at the Terre Haute Federal Correctional Complex for hatching. By the end of the month, nearly 50 lake sturgeon had hatched and survived to 2 weeks old. Unfortunately, feeding issues were encountered, and all the juvenile lake sturgeon died. This effort to headstart lake sturgeon will continue in 2015, with hopes that some fall fingerlings will be available for stocking.

To provide more protection to spawning lake sturgeon below Williams Dam, new regulations were proposed to limit fishing hook size. Specifically, for 2 miles downstream from Williams Dam, it would be illegal between March 15 and April 20 to use a single hook larger than 1/2 inch (from point to shank) or a double or treble hook on an artificial lure larger than 3/8 inch. This is an attempt to reduce the snagging of large adult lake sturgeon by anglers. The DFW hopes this proposal will become a permanent rule in 2015.

# **Longnose Dace Surveys in Lake Michigan Drainage**

Longnose dace (Rhinichthys cataractae) was added to Indiana's list of special-concern fish species in 2004. At that time, little was known of its distribution in the state. It was first recorded in Indiana in the 1940s from a single location in the St. Joseph River near Elkhart in Elkhart County. More recently, longnose dace have been collected from Baugo Creek by the City of Elkhart Public Works and Utilities and the Elkhart River by the Indiana Department of Environmental Management, both in Elkhart County, and in Lake Michigan, along the shoreline in Lake and Porter counties.

A survey to determine the distribution of longnose dace in Indiana was initiated in 2012. Longnose dace prefer fast, rocky, riffle habitats. These areas can be difficult to sample, which was likely the reason that there were only a few sporadic records for them over the years. For this survey, longnose dace were targeted using a combination of backpack electrofishing and seining. A small seine was placed in the riffle, then the area directly upstream was shocked and the substrate disturbed while working downstream toward the net. This method proved effective for collecting longnose dace

To date, longnose dace have been collected from the lower couple of miles of Baugo Creek (the section upstream from where it becomes impounded), from the lowest section of Yellow Creek, and from the Elkhart River from its confluence with the St. Joseph River upstream to the dam that forms Goshen Pond. Areas along the shoreline of Lake Michigan and riffle habitats in the St. Joseph River will be targeted in future sampling. Once that work is completed, the special concern status of longnose dace will be reviewed.



A longnose dace collected from Elkhart River in Elkhart County.



A close-up of the "long nose" of a longnose dace.



The Elkhart River at the dam that forms Goshen Pond. This is the upstream limit to longnose dace distribution in the Elkhart River.



Location of freshwater mussel survey in Crooked Lake in Whitley County.



A live rainbow collected from Crooked Lake.



A live pondmussel collected from Crooked Lake.



Live purple lilliput collected from Kuhn Lake in Kosciusko County.

# Freshwater Mussel Surveys in Natural Lakes in Northern Indiana

Nearly 150 of Indiana's natural lakes in northern Indiana were surveyed for freshwater mussels between 1998 and 2000. Much of the freshwater mussel surveys conducted in 2014 involved resurveying some of these lakes to see how populations were doing more than a decade later. Of particular interest was what effect zebra mussels (*Dreissena polymorpha*) had on the native freshwater mussel populations. When the original surveys took place, zebra mussels were relatively new to these ecosystems.

More than 20 lakes were resurveyed in summer 2014. When possible, the same locations were sampled, and the same effort was exerted as in 1998-2000. Interestingly, there was a difference among lakes and how zebra mussels seemingly affected the native freshwater mussel community. Lakes in the headwaters of the Tippecanoe River (James, Tippecanoe and Webster) were essentially devoid of live native freshwater mussels when resurveyed. One live mussel was found in the three lakes combined in over three hours of searching. In the previous survey of these same lakes, more than 100 live mussels were found with the same amount of effort. Other lakes that showed similar drastic declines in their native freshwater mussel communities included Lake George and Clear Lake, both in Steuben County, and Little Barbee Lake in Kosciusko County.

In contrast, some lakes seemed to have little change in the native freshwater mussel community, even with zebra mussels present since 1998–2000. In 2014 at Kuhn Lake in Kosciusko County, five live/fresh dead species and more than 100 live mussels were found, including purple lilliput (*Toxolasma lividum*), a state species of special concern that was not collected during the previous survey. Five live/fresh dead species and similar densities were found in the 1998–2000 survey. Lime Lake in Steuben County and Big Chapman and Irish lakes, both



A live giant floater collected from Little Chapman Lake in Kosciusko County, covered in zebra mussels.

in Kosciusko County, also had similar numbers of live/ fresh dead species and densities between this summer's survey and the previous one. Reasons for the stark differences in the effects of zebra mussels remain a mystery and a topic for further study.

Crooked Lake in Whitley County seems to have remained free of zebra mussels and still maintains one of the most diverse and dense mussel communities of any of Indiana's natural lakes. Wavyrayed lampmussel (Lampsilis fasciola), a state species of special concern, continues to reproduce in the lake, as do four other species: rainbow (Villosa iris); fatmucket (Lampsilis siliquoidea); giant floater (Pyganodon grandis); and pondmussel (Ligumia subrostrata).

## **Snuffbox Augmentation in the Tippecanoe River**

Snuffbox (Epioblasma triquetra) is a state- and federal-endangered freshwater mussel species that has declined drastically in Indiana. It was once present in multiple Indiana watersheds. Now it is found live in only three watersheds: the Salamonie River in Huntington County, the Tippecanoe River in White County, and Sugar Creek in Shelby County. It is likely only secure in the Salamonie River, in which multiple individuals and juveniles have been found (although only in about a 10-river-mile stretch). The other two populations seem precarious at best and may no longer be reproducing. A catastrophic event on the Salamonie River could cause the extirpation of snuffbox from Indiana. Augmenting one of the other populations would improve the snuffbox's chance for survival in Indiana. Federal funding was procured in 2012 to initiate a snuffbox augmentation project in the Tippecanoe River using female snuffbox from the Salamonie River population.

Snuffbox culture work was completed during 2014. On successive days in late April, 95 logperch (*Percina caprodes*), the host fish for snuffbox, were collected from



A female snuffbox displaying in substrate of the Salamonie River in Huntington County.



A logperch collected from the Tippecanoe River and used as a host for snuffbox glochidia.



A female snuffbox gaped open with a cork to extract glochidia.



A needle and syringe are used to flush glochidia from a female snuffbox.



The streamside laboratory used for snuffbox propagation work.

the Tippecanoe River, and female snuffbox containing glochidia (parasitic freshwater mussel larval stage) were located in the Salamonie River. The logperch were then transported to the Salamonie River, and a streamside laboratory was prepared.

Glochidia were extracted from eight female snuffbox.



Logperch gills with attached glochidia.



Logperch being added to cages for placement in Lake Shafer.

This was accomplished by gently opening the shell far enough to place a small cork between the valves to provide access to the gills. Each gill was then pricked along its length using a small needle and syringe. After each prick, glochidia were flushed from the gill into a container with a steady stream of water from the syringe. Glochidia were checked under a microscope for viability by placing a few into a Petri dish with water and adding salt. If they closed, they were considered viable. The glochidia collected from these eight female snuffbox were used to infect the 95 logperch from the Tippecanoe River. Logperch were not harmed during this process. Once culture procedures were done, all eight female snuffbox were returned to the location in the Salamonie River from where they were collected.

After all 95 logperch had been infected streamside,

they were transferred back to the Tippecanoe River (Lake Shafer). Five cage bases were filled with 2 inches of a sand, gravel and cobble mixture. Cage tops were then secured to the bases and the 95 logperch were evenly distributed among the five cages. The cages filled with substrate and containing the logperch were then secured (by pushing the legs of the cage bases into the substrate) to the bottom of Lake Shafer in a location where they could be monitored.

Over the next several weeks the logperch were periodically fed and the cage tops were cleaned. By around mid-June all logperch were released from the cages, and presumably the substrate in the bottom of the cages is now filled with juvenile snuffbox. These cages will remain in place until summer/fall 2015, when they will be pulled. The juvenile snuffbox will then be harvested and stocked at the augmentation sites in the Tippecanoe River.

# MAMMALS Allegheny Woodrat

The Allegheny woodrat (*Neotoma magister*) is a state-endangered native rodent that lives among the limestone cliffs and rock outcrops in the forested hills above the Ohio River. Also known as trade rats or packrats, woodrats are arguably one of the rarest and least-observed mammals in Indiana. They are only found along a 45-mile stretch of cliff lines in Crawford and Harrison counties. Recent surveys by Wildlife Diversity staff have typically captured fewer than 150 individuals.

"Woodrat" is an unfortunate name for such an engaging animal. Most people are familiar with the muchmaligned Norway rat (*Rattus norvegicus*) or sewer rat, a harmful pest often associated with urban and suburban environments. In contrast, Allegheny woodrats are clean and inquisitive, with large ears, a captivating face and nimble white feet. They resemble an oversized mouse. The packrat name comes from their habit of collecting and storing food and non-edible items in sheltered areas



A woodrat peers out from its protected hiding spot.



Allegheny woodrats collect plant material in late summer and store it beneath protected overhangs near their den sites. The dried vegetation sustains the animal during winter.



The view from an Allegheny woodrat site overlooking the Ohio River.

near their dens. These piles, called middens, often contain acorns, mushrooms and dried plant parts that the woodrat eats during winter. Woodrats also hoard an odd assortment of objects such as snail shells, coins, feathers and bones.

Wildlife Diversity biologists spent the 2014 field season scouting for additional woodrat populations in Crawford and Harrison counties. They found no evidence or sign in the areas examined. Next year, staff will conduct standardized live-trapping surveys at all eight population centers to gauge the status of this little known yet fascinating member of Indiana's native fauna.

#### **Badger**

The American badger (*Taxidea taxus*) is a mediumsized, solitary carnivore associated with prairies,



Badgers prefer open grassy habitats that provide adequate cover and support populations of voles, ground squirrels and other ground-dwelling prey.

meadows, hayfields and other grassy habitats in the Great Plains region of North America. This stocky member of the weasel family is specialized for digging and living underground. Badgers have low-slung bodies and powerful forelegs with long, heavy claws that allow them to quickly tunnel through soil to pursue prey that includes gophers, ground squirrels and other small rodents. Badgers are grizzled yellowish-gray in color with distinctive facial markings that feature a thin white stripe running from the nose over the top of the head, and white cheeks with a triangular black patch.

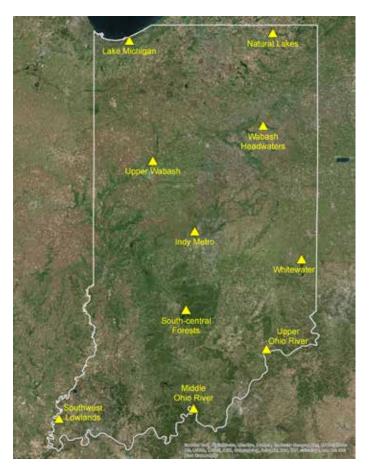
Badgers were listed as state-endangered in 1969 but were probably never common in Indiana. In the early 1900s, they were reported from only 12 counties. They gradually expanded southward through the state, most likely due to their protected status and conversion of forest cover to habitats more favorable for grassland-dependent species. By the mid-1990s, badgers were reported from 61 counties. In 2005, they were downgraded from endangered to special concern status.

Information gathered by Wildlife Diversity biologists suggest badgers remain generally uncommon in Indiana but are established in suitable habitats in the northern third of the state. They remain a unique and interesting member of Indiana's wildlife legacy and an integral component of high-quality natural communities in the state.

#### **Bats**

#### **Acoustic bat monitoring stations**

Thirteen bat species have been reported from Indiana. Each varies in its social structure (solitary or colonial), roosting habits (use of tree foliage, tree cavities, caves/mines, or buildings), and when they occur in the state (year-round or seasonal). Understanding the status and distribution of such a diverse group requires a broad array of monitoring techniques and surveys.



The statewide network of 10 monitoring stations collects acoustic information from bats throughout the year.



The Upper Wabash station is located in Prophetstown State Park near the confluence of the Tippecanoe and Wabash rivers.

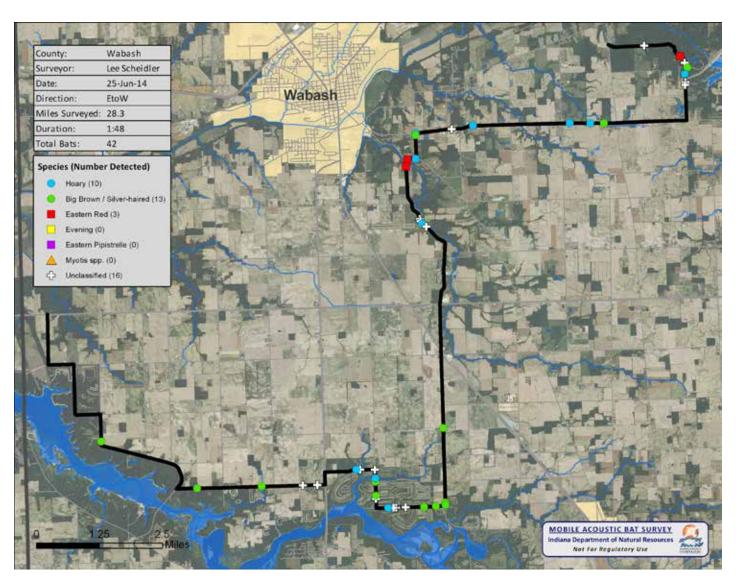
Wildlife Diversity staff recently added an exciting new tool to their bat monitoring toolbox, a statewide network of fixed acoustic monitoring stations. Each solar-powered station consists of a bat detector and microphone affixed to a tall steel pipe. These items are placed in open environments where bats are more likely to emit diagnostic search-phase calls that allow biologists to identify the particular bat species. The systems are



Wildlife Diversity personnel and staff from Eagle Creek Park at the site of the Indy Metro acoustic bat monitoring station.

programmed to passively record the echolocation calls of bats from sunset to dawn, year-round. The 10 stations are distributed throughout Indiana based on landscape features such as major rivers and lakes, habitat conditions, ownership and the availability of a cooperating partner to service the system. Participating properties include five state parks, two fish & wildlife areas, one state reservoir, Indiana Dunes National Lakeshore, and Eagle Creek Park.

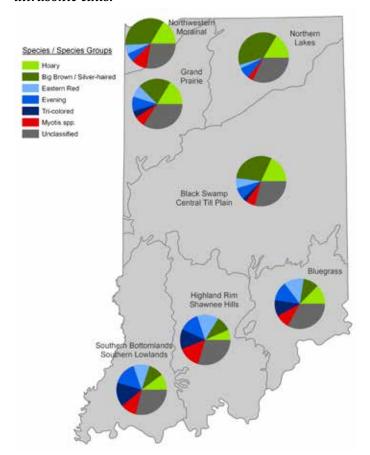
All stations became operational in August and have already provided useful information about fall migration patterns. In the future, the stations should also provide insight into when summer residents return and how that might be influenced by weather. Other information could shed light on winter activity levels, the long-term stability of summer colonies, and how data obtained from nearby mobile acoustic routes compare. Several sites also plan to incorporate an educational component to increase public awareness and appreciation about bats.



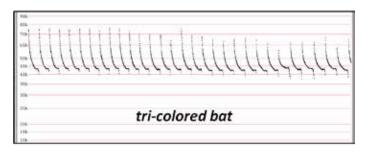
Results from a mobile acoustic survey in Wabash County in June 2014. Forty-two bats were detected. Their distribution reveals the importance of forested and aquatic habitats to bats that occupy agricultural landscapes.

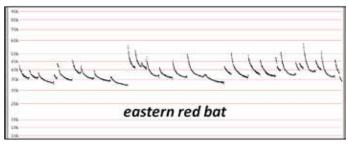


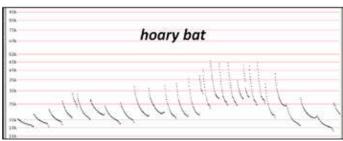
A roof-mounted microphone is used to record bats' ultrasonic calls.



Species representation by natural region from 2013 mobile acoustic bat surveys.







The frequency and structure of an echolocation call can be used to identify the species of a bat. Tri-colored bats emit consistent high-frequency pulses. Eastern red bats emit erratic middle-frequency pulses. Hoary bats emit low frequency pulses that are also variable.

#### Mobile acoustic bat survey program

Summer 2014 marked the fourth straight year of Indiana's mobile acoustic bat survey program. This statewide effort monitors the distribution and relative abundance of resident bats during their reproductive season. The program uses acoustic equipment in which an ultrasonic detector and vehicle-mounted microphone record echolocation calls emitted by bats. Surveyors drive predetermined routes (25–29 miles in length) shortly after sunset, when bats become active. Surveyors drive the same routes each year. Their work allows biologists to monitor multiple species at different locations throughout the state and across years.

One of the first tasks completed in 2014 was analyzing data collected the previous summer. More than 42,000 acoustic files were recorded from 238 mobile surveys in 2013. Of these, 9,370 contained the echolocation calls of free-flying bats (other files may contain noise from insects, machinery, birds or static).

Across the entire state, an average of 22 calls was detected each hour. That is a drop from 2012, when 33 calls were detected. Equally unsettling is that bat abundance declined in 48 of 57 (84%) counties surveyed in both 2012 and 2013. Calls identified as hoary bats

(Lasiurus cinereus) and those of the big brown/silver-haired (Eptesicus fuscus/Lasionycteris noctivagans) group represented a greater percentage of calls in 2013 compared to 2012. Calls from tri-colored (Perimyotis subflavus) and Eastern red bats (Lasiurus borealis) made up a smaller percentage. The percentage of calls identified as evening bats (Nycticeius humeralis) and those of the Myotis genus (Indiana, little brown, Northern long-eared and gray) were essentially unchanged.

In 2014, Wildlife Diversity biologists and contracted surveyors drove 279 acoustic surveys in 76 Indiana counties, a 16% increase from the previous summer. Data analysis continues as biologists refine program standards for the acoustic identification of bats. Manual analysis of acoustic files provides greater accuracy in species identification but is impractical for larger studies that generate tens-of-thousands of files. Indiana is experimenting with several automated identification software programs that can process data in a timely manner and ensure consistency both across surveys and from year-to-year.

#### Winter bat counts

Counts of bats in winter hibernation sites have taken place in Indiana for more than 30 years. The work has yielded one of the longest-running datasets known for populations of cave-dwelling bats. Winter surveys have historically targeted caves used by the endangered Indiana bat (Myotis sodalis). Those surveys provide insight into the species' progress toward recovery. They also shed light on the status of other species, including the little brown bat (Myotis lucifugus), northern long-eared bat (Myotis septentrionalis), tri-colored, and big brown bat. The value of this information has risen as WNS continues to impact winter bat populations throughout eastern North America.

Fifteen caves, most of which contain relatively small populations, were visited in January and February 2014. Nearly 1,800 bats of five species were tallied. The most significant finding was the precipitous decrease in over-



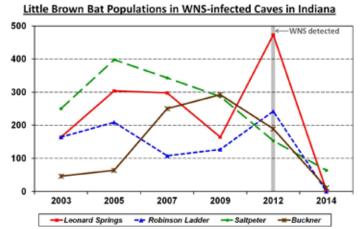
A group of big brown bats on a shallow ledge.



A cluster of 135 Indiana bats was counted from a photograph by placing a yellow dot on each bat's nose.

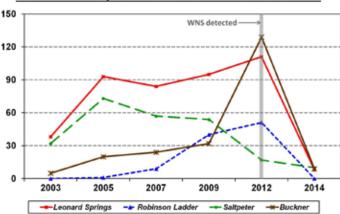


A small cluster of hibernating tri-colored bats.



Winter populations of little brown bats have declined 80% in WNS-infected caves in Indiana.

## Tri-Colored Bat Populations in WNS-infected Caves in Indiana



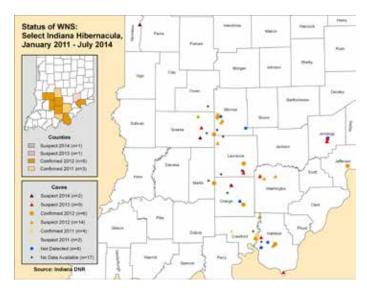
Winter populations of tri-colored bats have declined 45% in WNS-infected caves in Indiana.



A survey crew counts bats in Panther-Neyman Cave.

all abundance in nearly all hibernacula. Populations had declined since the most recent survey in 14 caves, showing a combined loss across all sites of nearly 4,200 bats (-71%). Ashcraft Cave was the exception. Its numbers jumped modestly from 24 to 49 bats since its last count nearly a decade ago. Four caves suffered potentially irrecoverable losses greater than 90%. To illustrate, a single big brown bat was found in Robinson Ladder Cave, a site that has housed an average of 375 bats for the last 25 years. Similarly, the population in Leonard Springs Cave plummeted from 615 bats to 11 (-98%) in just two years.

Such disturbing findings are almost certainly a result of WNS, which was first found in nearly all of these caves in 2012. Two species, the little brown bat and tri-colored bat, were affected most. The same trend was observed in other WNS-infected states. In Indiana, little brown bats declined in every cave visited in 2014. The total population dropped more than 90% (3,311 bats to 325) in two years. Tri-colored bats, the smallest bats that winter in Indiana, are often found in small numbers in many caves. About 300 were counted in 2014, a loss of 425 bats (-58%) since 2012. The endangered Indiana bat



Since 2011, evidence of WNS has been found in 37 caves in 11 Indiana counties.

declined 31% (977 bats to 671) in nine WNS-infected sites from 2012 and was not found in three previously occupied hibernacula.

WNS was first found in Indiana in January 2011. Surveys four years later show the disease has progressed to levels that cause high rates of mortality for little brown bats and, to a lesser extent, tri-colored bats. Surveys slated for the 2014–15 winter will provide further insight into the impact of WNS on Indiana's largest hibernacula, most of which will have been infected for at least five consecutive winters.

# REPTILES AND AMPHIBIANS Eastern Box Turtle

Box turtles are identified by the hinge on the underside, or plastron, of their shell. This hinge allows them to fold in their head and limbs for protection. In Indiana, there are two species of box turtles, the state-endangered ornate (*Terrapene ornata*) and the Eastern (*Terrapene carolina*), which is listed as special concern.

The closely related species live the majority of their lives on land but prefer different habitats. Ornate box turtles are a sand-loving species that exist only in the northwestern part of the state. They are smaller than the Eastern box turtle. The domed part of the ornate's shell, the carapace, features a pattern of radiating lines. Eastern box turtles are a woodland species. They occur more prominently in southern Indiana, with a spotty distribution in the central and northern parts of the state. While Eastern box turtles can have radiating lines on their carapace, they are mostly known for their varied and vibrant color patterns. Males often have brightly colored yellow or orange heads.

Eastern box turtles are most active during the first few weeks of warm spring weather and after heavy rains. Unfortunately, many end up on the road and get hit by vehicles. If you encounter a turtle in the road, the best



Naturalist aide Christie Hubbard uses radio-telemetry to follow the movements of the resident Eastern box turtles on the Columbia Mine Preserve at Patoka River National Wildlife Refuge.

thing to do is place it on the side of the road in which it was facing. Box turtles have a home range in which they make all of their movements for finding food, shelter and mating. They instinctively will try to return to their home area if moved. This trait makes them more susceptible to getting hit on the road if placed far from their original location.

In 2004, Indiana declared Eastern box turtles a special protected species. This makes it illegal to possess an Eastern box turtle or any of its body parts without a permit. In response to growing concerns about box turtle declines across the country and about how building a new interstate in Indiana would affect local populations, Wildlife Diversity biologists rescued more than 200 Eastern box turtles from the proposed I-69 alignment in southern Indiana during 2010, 2011 and 2012. Each turtle was weighed, measured and given a unique identification number before being placed in a secure, semi-natural environment.

Scientific research determined it was unsafe to return



The plastron, or underside, of an Eastern box turtle within the enclosure at the Columbia Mine Preserve. Each turtle was given a unique identification number.



An Eastern box turtle in a partial form under a small tree within the enclosure at the Columbia Mine Preserve. "Form" refers to the depression a turtle digs for protection from the elements and predators.



A view from the sloped side of the Eastern box turtle enclosure at Columbia Mine Preserve.

these turtles where they came from after the interstate was completed because of high mortality rates of turtles near large, busy roads. Instead, these turtles will be released in 2015 on reclaimed mine land as part of a reintroduction program.

Due to the homing instinct of the turtles, successfully doing so will involve more than merely releasing the turtles in the new area. To reset the turtles' site fidelity instinct, they were moved to an enclosure in their new habitat in 2013. A minimum of two years will be required for them to adopt a new home area. A subset of box turtles in the remnant population on the reclaimed mine land is being tracked using radio telemetry. Locations, temperature and habitat use are recorded three times per week. Once the captive turtles are released, a subset of those turtles will be radio-tracked for two years. Data from the resident turtles will be compared to data from the post-release captive turtles.

In fall 2012, before being moved to the new enclosure, three captive box turtles died from *Ranavirus*, which causes mass die-offs in reptiles and amphibians. Testing confirmed the presence of *Ranavirus* in most of the captive turtles. The disease was also present in the freeranging box turtle population, other species of turtles, and tadpoles from the reclaimed mine land. Once it was determined that the captive turtles did not threaten the residents, the captive turtles were moved to their new enclosure. Between spring 2013 and fall 2014, approximately two-thirds of the captive colony died from Ranavirus. To learn about the disease, bi-weekly blood samples and swabs were taken from the captive colony in both years.

To get a better picture of *Ranavirus* in Indiana, statewide testing began in 2013. Green frog and/or bullfrog tadpoles were collected from 15 different locations. Locations sampled in 2014 included: Shades and Pokagon state parks; Pigeon River, Roush, Willow Slough, Winamac, Hillenbrand and Wilbur Wright FWAs; Moraine Nature Preserve; Big Oaks National Wildlife Refuge; and Hoosier National Forest. Sites sampled in 2013 included Avoca, Cikana, Driftwood and East Fork state fish hatcheries. Results from those tests are pending.

#### Green Salamander

The green salamander (Aneides aeneus), with its green lichen-like markings, slender body and rounded head, is one of Indiana's most distinct salamanders. The species has long toes that are squared on the tip. This trait allows them to climb freely on vertical cliff faces or trees. Indiana's population is isolated from the species' primary range, which is more Appalachian.

Green salamanders were discovered in Indiana in 1993, when researchers were seeking Allegheny woodrat habitat. Green salamanders prefer wooded sandstone outcrops with deep crevices that are moist but not wet. These crevices serve as protective hiding places as well as areas where females will suspend their eggs from the overhead rock surface.



Assistant biologist Jason Mirtl walks along a cliff-line surveying for green salamanders.



Herpetologist Sarabeth Klueh-Mundy and assistant Jason Mirtl check crevices as they survey for green salamanders.



A green salamander from Crawford County. This species was discovered in Indiana in 1993.

The species is state-endangered due to its habitat requirements and limited distribution. Its only known locations are Crawford and Perry counties. After 1993, no additional green salamander populations were located until 2007. Intensive surveys in fall 2010 and again in 2012 turned up six more sites (three each year) for a total of eight different sites. One new location from 2012 had hatchling green salamanders in both 2012 and 2013. In both years the clutches were being guarded by an adult female. Only adults were observed on a return visit in 2014. Visits to other historic sites also resulted in observations of adult green salamanders. A new site discovered north of I-64 in 2014 represents the northernmost locale in Indiana.

#### Eastern Hellbender

The Eastern hellbender (Cryptobranchus alleganiensis alleganiensis), Indiana's largest salamander, once occurred in a handful of rivers and streams in southern Indiana. An indicator of water quality, this state-endangered species requires cool, highly oxygenated, fast-flowing rivers and streams with large rocks that offer protection. This giant salamander, which can grow 2 feet or longer, is now found only in the Blue River.

The DNR started long-term monitoring of the hellbender in 1996. In 1998, 12 sites were identified based on the availability of suitable habitat. Those sites were surveyed semi-annually until 2008. In 1999 a total of 49 hellbenders were found, the most during any DNR survey. Individuals were recorded at nine out of the 12 sites. Numbers have decreased dramatically since the record-setting survey.

Some of the original 12 sites are no longer being surveyed, either due to habitat degradation or lack of hell-bender observations over an extended period of time. In addition, Indiana has discontinued annual surveys of these 12 sites. Recent research indicates that traditional survey methods can destroy habitat. Many states have opted to survey on a biennial basis. In 2014, six of the original sites were surveyed. Only one individual was recorded.

It is important to note that even though the hellbender exudes a slimy substance from its skin and may look menacing, it is neither poisonous nor venomous. Note also that hellbenders feed primarily on crayfish, not fish, and therefore do not affect sport fish populations.

If you catch a hellbender while fishing, cut the line, leave the hook, and gently place the animal back in the water.

# North American Amphibian Monitoring Program

Every early spring through late summer, Indiana erupts with the beautiful sounds of chorusing frogs and toads. From the large bullfrog (Lithobates catesbeianus) to the tiny cricket frog (Acris crepitans) each has a unique mating call. You may have heard the melodious call of the gray treefrog (Hyla versicolor) or the spaceship-like call of the American toad (Anaxyrus americanus) and thought they were some other animal or insect.



Assistant biologist Jason Mirtl on his way to set traps for Eastern hellbenders.

Volunteers for the North American Amphibian Monitoring Program (NAAMP) are tasked with learning the calls of all 17 Indiana frog and toad species. You might think that a small frog like the spring peeper (Pseudacris crucifer) would be hard to hear over larger species like Southern leopard frogs (Lithobates sphenocephalus), but even a handful of spring peepers can sound almost deafening.

This past year, 22 volunteers collected data from 23 predetermined routes. Most volunteers (19) ran their routes during all three different time "windows." Because certain species only call during certain timeframes, having windows allows us to collect data on more species over the duration of the breeding season. A total of 14 species were detected out of a possible 17, an 82% detection rate.

If you like listening to frog calls or are interested in conservation, NAAMP might be for you. NAAMP is administered in cooperation with the United States Geological Survey. NAAMP started because of increasing concerns about global amphibian declines.

Volunteers must follow strict protocols for data collection and pass a frog- and toad-call identification test. Each driving survey route stops 10 times near suitable habitat. Observers listen for five minutes and record species present at each stop. Volunteers collect data a minimum of three times between February and June each year.

## Rare Salamanders

# Be on the lookout for these rare salamanders.

### **Hellbenders**

- A giant aquatic salamander that can reach
   2 ½ feet in length
- Found in the tributaries of the Wabash and Ohio Rivers in Southern Indiana
- · Prefer cool, rocky, swiftly flowing streams
- Their presence indicates good water quality
- Feed mainly on crayfish, not fish
- They are NOT venomous
- · Their slime is not poisonous
- They have no negative effects on fish populations
- · Endangered in Indiana

If caught, please cut the line, release unharmed, and contact (812) 334-1137.



## **Mudpuppies**

- A large aquatic salamander that can reach 16 inches in length
- Found throughout Indiana
- Live in lakes, ponds, rivers, and streams
- · Their presence indicates good water quality
- Feed on crayfish, larval insects, and small fish
- They are NOT venomous
- Their slime is not poisonous
- They have no negative effects on fish populations
- Special concern in Indiana



Learn the difference between hellbenders and mudpuppies, two species that are difficult to tell apart. If you encounter either, contact Wildlife Diversity personnel.

To volunteer, see www.pwrc.usgs.gov/naamp, or email naamp@dnr.IN.gov to learn more. To learn more about the frogs and toads of Indiana, see dnr.IN.gov/fishwild/3325.htm.

There are many NAAMP routes with no volunteers. Check if there are any vacant routes near you at www. pwrc.usgs.gov/naamp.

# The Division of Fish & Wildlife thanks the 2014 NAAMP volunteers for their invaluable assistance.

#### Volunteers that ran all three windows:

Iohn Bednar\*

Charles Boswell

Merilee Britt

lim Brown

. Bill <u>Dean</u>

Jane Fuller

Barbara Harcourt\*

Julie Henricks\*

Lara Ibey

Darrel Joy

Erin Malcomb

Vicky Meretsky

Keith Michalski

lason Mirtl\*

James Neal

Tim Shier

Robin Stark\*

Steve Trippel

John Tritt^

Maryann Watson

#### Volunteers who ran two windows

Jack Still

Katherine Taylor

^New volunteers

\*Ran two routes

#### **JOHN CASTRALE RETIRES**

In 2014, John Castrale retired as the Wildlife Diversity bird biologist. Hoosiers should feel honored that John spent his 32-year career working in Indiana. He is revered among peers and colleagues for the dedication, knowledge and passion he brought to his work. This same sentiment is heard from the many volunteers and citizens who regularly interacted with him. John's demeanor was always humble and welcoming, and he enjoyed talking with people of all ages about the wonderful attributes of birds.

His DNR accomplishments were many. In 1998, he co-authored and oversaw publication of the first "Atlas of Breeding Birds in Indiana." His diligent work on reintroduction programs resulted in bald eagles and peregrine falcons coming off Indiana's state endangered species list, and helped bring osprey back to Indiana. He provided valuable input at the state, regional and national levels regarding conservation initiatives and activities that benefitted numerous bird species and their habitats.

John was the ultimate professional and a frequent contributor to the Indiana Audubon Quarterly and Proceedings of the Indiana Academy of Science. His many awards and accolades further illustrate the level of excellence he maintained throughout his career. In 1998, John was recognized as an Academy Fellow by the Indiana Academy of Science for his service to the Academy and his contributions to science and education within the state. The next year, the Indiana Audubon Society honored him with the Earl Brooks Award, the society's highest tribute for contributions to conservation in Indiana. In 2002, he received the Raymond E. Wilson Award for Biologist of the Year, the top honor given by the DFW.

John's dedication to preserving bird diversity in Indiana was driven, in part, by his own interest in bird watching. Wildlife enthusiasts may still see him around. He will likely volunteer on some of the projects he pioneered during his DNR career.



After working more than 30 years for the DNR, John Castrale retired as the Wildlife Diversity bird biologist in 2014. His talent and friendship will be missed.

# **WILDLIFE RESEARCH**

#### **FUNDING**

DFW Wildlife Research survey and monitoring activities are primarily funded through state hunting license fees and federal Pittman-Robertson (PR) Act funds. PR funds are derived from an 11% federal excise tax on sporting arms, ammunition and archery equipment, and a 10% federal excise tax on handguns. When hunters and shooters purchase these items, the manufacturers pay the excise tax.

The excise taxes are deposited into the Wildlife Restoration Account, administered by the USFWS. These funds are then made available as grants through the USFWS to each eligible state, based on the size of the state and its number of licensed hunters.

#### WILDLIFE RESEARCH STAFF

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Budd Veverka, farmland biologist Bloomington (812) 334-1137 bveverka@dnr.IN.gov

Adam Phelps, waterfowl biologist Bloomington (812) 334-1137 aphelps@dnr.IN.gov

Steve Backs, ruffed grouse and wild turkey biologist Mitchell (812) 849-4586 sbacks@dnr.IN.gov

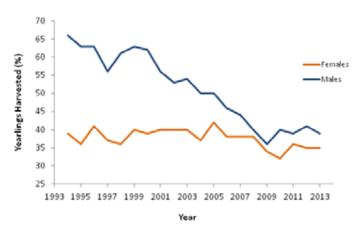
Naturalist Aides: Jamie Brown, Megan Dillon, Anna Rossler, Erica Skorlinski, and Tessa Sullivan The states use the grants to fund habitat and species restoration, research, management, land acquisition, hunter access, facilities construction and maintenance, archery and shooting ranges, and hunter education. The USFWS Wildlife Restoration grants fund up to 75% of the eligible costs with the other 25% being provided by the state. Usually the state match comes from state hunting license revenues; however, other partners such as universities or private conservation organizations sometimes provide the match. During 2014, Wildlife Restoration grant funds totaling \$604,145 were used to conduct Wildlife Research projects in Indiana.

### DEER

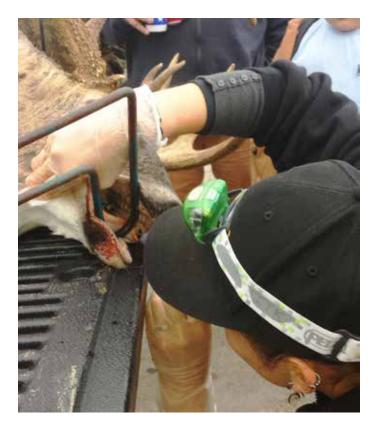
#### **Biological Deer Check**

To monitor deer herd structure in Indiana, DNR staffers annually collect information from hunter-harvested deer during the first weekend of firearms season in mid-November. In 2013, 2,672 deer were examined to determine age, sex and signs of disease at check stations and FWAs across the state. Sixteen percent were fawns; 32% were yearlings; 32% were 2.5 years old; and 20% were 3.5 years or older. Among adult deer, yearlings represented 39% of the males (bucks) and 35% of the females (does), which is similar to percentages seen in the past five years. Compared to 2012, the proportion of 2.5-year-olds in the adult buck harvest remained at 38%, while the corresponding statistic for does increased 2%. Among adult bucks, 23% were greater than or equal to 3.5 years old, up 2% from last year. This was the sixth consecutive year averaging 20% or greater.

In a given year, the proportion of yearlings in the adult harvest can provide insights about herd recruitment (addition of young deer into the population), while trends in this statistic over time usually reflect changes in harvest pressure. Because bucks are often harvested selectively (older bucks preferred), while does are not,



Proportion of yearling (age 1.5) males and females in the 2013-14 harvest.



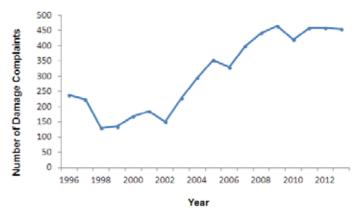
A DFW biologist inspects tooth wear of a harvested buck to determine its age.

differences in harvest pressure can be seen when looking at the sexes separately. In Indiana, the proportion of yearlings in the adult buck harvest has decreased since 1994. Over the same time period, the proportion of yearling does in the harvest has been stable, suggesting that this finding does not reflect lowered recruitment, but rather a decrease in harvest pressure on younger males. It is possible that this is a result of the 2002 implementation of the one-buck rule, which was designed to reduce harvest pressure on male deer.

#### **Deer Damage Control Program**

Some damage to property (especially crops) is a natural consequence of the presence of white-tailed deer. The DNR responds to landowner complaints by conducting on-site inspections where damage has occurred and providing appropriate technical advice to landowners. Sometimes, non-lethal methods such as fencing and repellants are advocated, but often hunting is the most feasible option to reduce further damage. If lethal options are deemed appropriate, the DNR may issue deer damage control permits for removal of deer outside the normal hunting season.

The deer damage control permit program is designed to provide landowners (usually farmers) immediate relief from severe damage while the damage is occurring. The program allows the removal of deer outside of season where damage exceeds \$500 and non-lethal measures would be inadequate.



Deer damage reports have steadily increased since 1998. Attempts to reduce and stabilize the deer population began in 2003.



Damage to a corn row caused by browsing deer.

During 2013, the DNR received 454 damage complaints, mostly for damage to soybean (46%) and corn crops (35%). This was a 1% decrease compared to complaints received in 2012, and the fourth highest of any years after elimination of the deer depredation zones in 1995. Ninety-three percent of the complaints involved properties with a previous history of deer damage and 73% of the complainants had previously worked with DNR personnel on damage problems. Of all properties filing damage complaints, 95% of the landowners already hunted their property. Thirty-four percent of complainants reported crop loss of between 1–5%, with most damage reported during the peak growth period in June and July. Privately owned parcels adjoining the damaged property were implicated as a contributing factor to damage in 74% of the cases investigated, while 5% of adjoining parcels were government owned.

In response to deer damage complaints, the DNR issued 479 control permits (5% more than in 2012), allowing a maximum take of 6,566 deer. Of those, 2,419 deer were harvested, which equates to a success rate of 37%.

Of the harvested deer, 315 were reported as adult bucks (13%), 236 were reported as male fawns (10%) and 1,868 were reported as female (77%).

The deer damage control permit program is not a deer population control tool, but rather a tool to address immediate issues on specific private properties. Deer population control at the county population level is achieved through annual adjustments to county bonus antlerless deer bag limits carried out during the regular deer hunting season.

#### **CWD Monitoring Program**

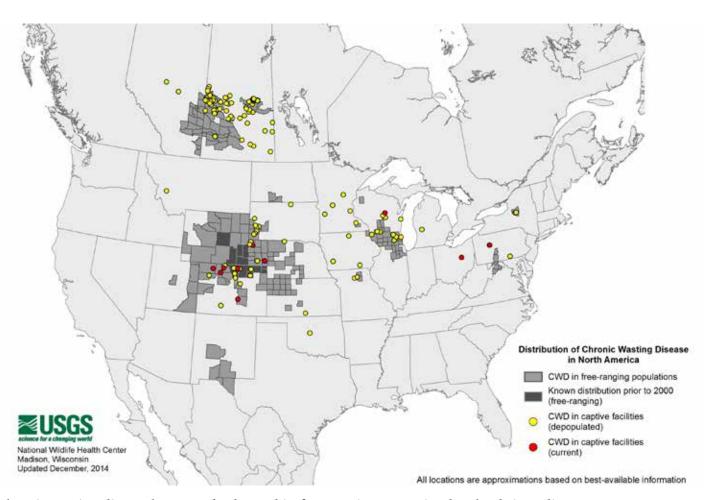
Chronic wasting disease (CWD) affects animals in the deer family (Cervidae), including white-tailed deer (Odocoileus virginianus), elk (Cervus elaphus) and moose (Alces alces). CWD is part of a group of diseases called transmissible spongiform encephalopathies, a group that also includes mad cow disease in cattle, scrapie in sheep and Creutzfeldt-Jakob disease in humans. The active agents of CWD are abnormal cellular proteins called prions. Prions are resistant to normal degradation and cause neighboring proteins to become abnormal, thus spreading through the body. These prions are resistant to heat and disinfectant (Davidson 2006) and, once in the environment can remain active for several years. Infected animals can take more than a year to develop



White-tailed deer exhibiting symptoms of chronic wasting disease. (Photo courtesy of Wisconsin Department of Natural Resources and the CWD Alliance.)

symptoms. The disease is always fatal. No case of transmission of CWD to humans has been recorded.

Unknown in wild deer until the 1980s, CWD in both captive and wild herds has been reported in 24 states, including Wisconsin, Illinois and most recently Ohio.



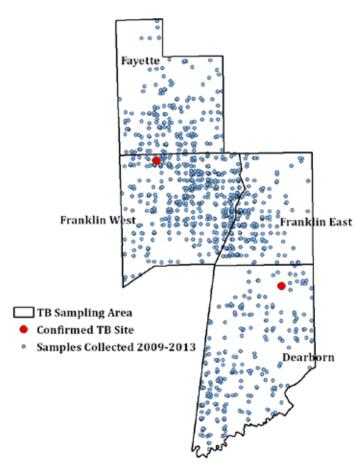
Chronic wasting disease has yet to be detected in free-ranging or captive deer herds in Indiana.

Since 2002, Indiana has been testing tissue samples from hunter-harvested and road-killed deer throughout the state as part of a CWD monitoring program (active surveillance). Nervous system tissue is required to test for CWD prions, and currently there is no reliable way to test for the disease in living animals. However, noticeably sick deer reported by citizens are targeted for sampling (targeted surveillance).

In 2013, the state collected and tested 1,026 usable samples through its active surveillance program (hunter harvested and road-kill deer). Six suspect deer were euthanized and tested through the targeted surveillance program. Analyses on all samples have been completed, with none of the samples detecting the presence of CWD prions. Since monitoring began in 2002, more than 16,800 samples have been collected by the DNR with none testing positive for CWD.

#### **TB Monitoring Program**

Bovine tuberculosis (TB) is a chronic disease caused by the bacterium *Mycobacterium bovis*. Transmission occurs most commonly through inhalation of infectious, airborne particles or by ingestion. Named "bovine" for the fact that it is most often found in cattle, the bacte-



Harvest locations of wild deer sampled since 2009 as part of Indiana's bovine tuberculosis surveillance program (blue dots) and locations of the two captive herds where TB was identified.

rium can exist in populations of other species (known as reservoir hosts), and can affect almost any mammal, including humans. The existence of multiple reservoir host species makes eradication of the disease difficult. The white-tailed deer is one such species.

In 2009, captive deer in a cervid farm in Franklin County tested positive for TB. Investigations by the Indiana Board of Animal Health (BOAH) determined that two additional cervid farms had received deer from the infected cervid farm, one each in Harrison and Wayne counties. Further testing within these herds found that the disease had not spread to other captive animals. Samples were also taken from the wild deer population surrounding the facility and failed to detect TB. However, an ongoing surveillance program was established in Franklin and Fayette counties to sample and test hunter-harvested deer to determine if the wild population were acting as a reservoir for the disease.

In 2011, four animals from a cattle farm in northern Dearborn County tested positive for the same strain of TB that was found at the Franklin County cervid farm. Upon further testing, the bacterium was identified in several more animals. Due to this significant finding, surveillance efforts expanded to include Dearborn County beginning in 2012.

During the first weekend of the deer firearms season in 2013, DFW members staffed check stations in Franklin, Fayette, Ripley and Dearborn counties to collect deer heads from willing hunters. Several lymph glands were taken from each head and submitted to Purdue's Animal Disease and Diagnostic Lab (ADDL) and the National Veterinary Services Laboratory (NVSL) in Ames, Iowa by BOAH and U.S. Department of Agriculture (USDA) personnel. A total of 102 deer heads were collected: 16 from Dearborn County, 20 from Fayette County and 64 from Franklin County. Two samples were taken from just outside the surveillance area.

Test results indicated that TB was not present in any sampled deer. Hunters in these regions are still encouraged to report deer that exhibit symptoms of TB to their district wildlife biologist or to BOAH. Symptoms include coughing, difficult breathing and white lesions on the internal organs or ribcage. Since 2009, a total of 1,309 wild deer have been sampled in the TB surveillance zone. No positives have been detected.

### **FURBEARERS**

#### **Archer Index Survey**

Archery hunters play an important role in monitoring the abundance of furbearer and other wildlife species in Indiana. Since the early 1990s, Indiana archery hunters have voluntarily shared their wildlife observations with the DNR as a method for monitoring trends in statewide wildlife populations. This partnership has provided a consistent and inexpensive method for monitoring many wildlife species.

Before archery hunting season, hunters who have volunteered to participate in the survey are sent a packet including a standardized survey form and directions for recording wildlife observations. Hunters are asked to record the number of hours spent hunting each day, noting either morning or evening hunts, and the number of each wildlife species observed.

After the survey, participants return their completed form to the DFW. Population indices are tabulated by dividing the number of each wildlife species sighted by the number of hours hunted. The index is represented as the number of sightings per 1,000 hours of hunting summarized for statewide and regional totals.

Indiana archery hunters recorded sightings of furbearer and other selected wildlife species from Oct.1 through Nov. 15, 2013. Archers conducted 3,984 hunts during the survey, resulting in 11,982 hours of observations.

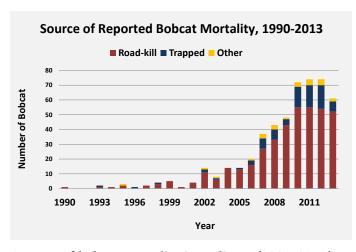
White-tailed deer were the most frequently sighted species, and the observation rate for deer has trended upward over the last 20 years. Raccoons were the most frequently sighted furbearer, only slightly higher than coyote (Canis latrans). Sightings of gray fox (Urocyon cinereoargenteus) and red fox (Vulpes vulpes) have decreased over the last 20 years. Fox squirrels (Sciurus niger) were the most frequently sighted small game species. The wild turkey (Meleagris gallopavo) was the most frequently sighted game bird, while Northern bobwhite (Colinus virginianus) sightings continued a downward trend.

#### **Bobcat Monitoring**

Since the late 1980s, the DFW has recorded annual bobcat mortalities reported to and confirmed by DNR personnel. Mortality reports are used to collect biological and distribution data for bobcat in Indiana.

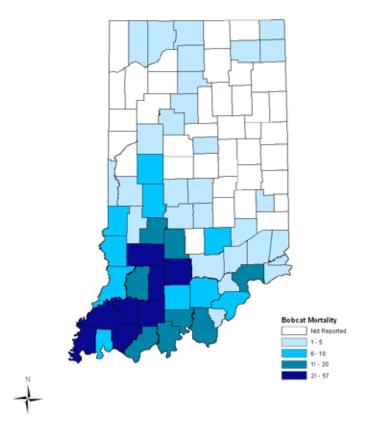
Correspondence is sent annually to DNR Law Enforcement and wildlife personnel requesting reports of bobcat mortalities including animals road-killed, incidentally trapped or killed by other causes. Decisions on what carcasses to salvage are made annually.

A datasheet is used to collect temporal and spatial information for each animal. Salvaged bobcats are tagged and biological samples are collected, including physical



Sources of bobcat mortality in Indiana (1990-2013).

#### Cumulative Distribution of Reported Bobcat Mortality in Indiana, 1990-2013



Distribution of reported bobcat mortalities in Indiana (1990-2013).

measurements, a canine tooth for aging, and reproductive tracts from females.

Sixty-one bobcat mortalities were reported and confirmed from 30 counties in 2013. This is the fourth consecutive year bobcat mortalities exceeded 60 animals. Fifty-two bobcats were road-killed, seven were accidentally trapped or snared and two were killed by other causes. Bobcat mortalities are reported more frequently in fall and winter. Bobcat mortality reports primarily come from Indiana's southern counties.

### Fur Harvest and Value Survey

The statewide fur harvest and value survey is conducted annually by the DFW to monitor the number and value of furbearer pelts purchased by licensed fur buyers. After furbearer harvest seasons end, licensed fur buyers must submit a report to the DFW listing the number and average value of furbearer pelts purchased.

Eighty-seven licensed fur buyers submitted reports after the 2013–14 fur harvest season. During the 2013–14 fur harvest season, fur buyers purchased 162,845 pelts equaling a value of \$1,792,523.28. Compared to the previous season, the number of pelts decreased 13% and the value decreased 5%.

Raccoon and muskrat (Ondatra zibethicus) accounted

	No.	No.	0.4			0.4			0/
Species	Purchased 2012-13	Purchased 2013-14	% Change	Avg. Pelt Price 2012-13	Avg. Pelt Price 2013-14	% Change	Total Value 2012-13	Total Value 2013-14	% Change
Орослос	2012 10	20:0::	o nango			onango	2012 10	201011	Thange
Muskrat	73,531	57,414	-22%	\$10.07	\$9.54	-5%	\$740,523.04	\$547,497.12	-26%
Raccoon	96,431	90,305	-6%	\$12.18	\$11.38	-7%	\$1,174,171.73	\$1,027,981.21	-12%
110000011	00,101	00,000	0,0	Ψ12.10	Ψ11.00	1 70	ψ1,111,111110	Ψ1,021,001.21	1270
Red Fox	1,293	1,386	7%	\$30.37	\$30.90	2%	\$39,264.03	\$42,825.98	9%
0	005	405	400/	<b>600.70</b>	<b>#05.00</b>	20/	<b>#C 044 00</b>	<b>#5.045.00</b>	400/
Gray Fox	225	195	-13%	\$26.72	\$25.88	-3%	\$6,011.83	\$5,045.69	-16%
Mink	2,393	2,038	-15%	\$17.30	\$15.29	-12%	\$41,388.61	\$31,166.07	-25%
TVIII II C	2,000	2,000	1070	Ψ17.00	ψ10.20	1270	ψ 1 1,000.01	φοι, ισσ.σι	2070
Opossum	2,837	3,327	17%	\$1.55	\$1.74	12%	\$4,399.21	\$5,796.54	32%
Striped									
Skunk	119	111	-7%	\$3.31	\$3.00	-9%	\$393.50	\$333.35	-15%
Beaver	4,331	2,651	-39%	\$16.51	\$15.20	-8%	\$71,524.21	\$40,288.36	-44%
Coyote	5,134	5,413	5%	\$17.89	\$16.92	-5%	\$91,858.17	\$91,581.46	0%
Long-tailed									
Weasel	6	5	-17%	\$0.79	\$1.50	89%	\$4.75	\$7.50	58%
Total/									
Averages	186,300	162,845	-13%	\$11.65	\$11.01	-5%	\$2,169,539.08	\$1,792,523.28	-17%

Fur harvest, average pelt prices, and total value by species for the 2012-13 and 2013-14 fur trapping seasons.

for 91% of pelts purchased. The number of red fox, coyote and Virginia opossum (*Didelphis virginiana*) pelts purchased in 2013–14 increased from the previous season, whereas the number of muskrat, raccoon, gray fox, mink (*Mustela vison*), striped skunk (*Mephitis mephitis*), beaver (*Castor canadensis*) and weasel (*Mustela frenata*) pelts purchased decreased.

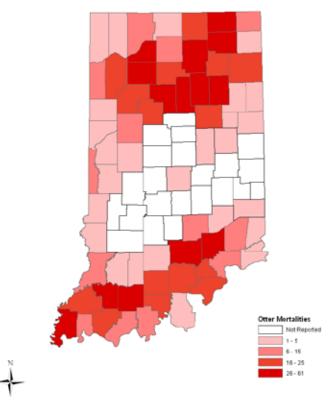
#### **River Otter Monitoring**

DNR personnel collect incidentally killed river otters (Lontra canadensis) reported to the DFW and DNR Law Enforcement as part of the state's monitoring program. Indicative of a healthy and expanding population, the number of incidentally killed otter has increased



Sources of river otter mortalities in Indiana from 1995 to 2013.

#### Cumulative Distribution of Reported River Otter Mortality in Indiana, 1995-2013



Distribution of river otter mortalities in Indiana from 1995 to 2013.

considerably over the last 10 years and has exceeded 100 animals each of the last three years. In 2013, 119 river otter mortalities were reported and confirmed from 42 counties. Twenty river otters were road-killed, 97 were accidentally trapped or snared, and two otters were killed by other causes.

Thanks to the continued support of trappers to turn over incidentally trapped otters, the DFW has been able to maintain records and collect biological samples from these animals. The animals provided vital information regarding the distribution and reproduction of river otters in the state.

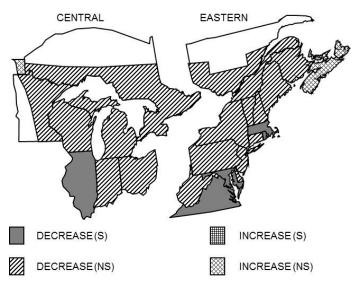
#### **GAME BIRDS**

#### **American Woodcock Population Status**

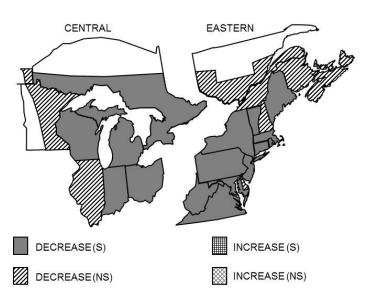
The American woodcock (Scolopax minor) is a popular game bird throughout much of the eastern United States. Because the species is migratory, the USFWS is responsible for its management. State and provincial wildlife agencies, in cooperation with the USFWS, gather survey data annually to get reliable population and harvest estimates, and to collect information on breeding success, recruitment and distribution. The Indiana DFW has cooperated with the USFWS since the inception of the wing collection survey in 1963, the American woodcock survey in 1968, and the Harvest Information Program (HIP) in 1999. The USFWS Office of Migratory Bird Management assigns survey routes to count vocalizing male woodcock during the bird's peak display period, shortly after sunset. For the wing collection survey, the age and sex of each bird is determined at an annual meeting in early spring after the hunting season.



Current range and singing ground survey coverage (SGS) for the American woodcock.



Population trend within each state in the SGS over the past 10 years for American woodcock (S = statistically significant; NS = not statistically significant).



Population trend within each state in the SGS over the long-term study (1966–2014) for American woodcock (S = statistically significant; NS = not statistically significant).

Woodcock are managed in two regions: Eastern and Central. The Central Management Region consists of 19 states and two Canadian provinces. Indiana is one of six states and two provinces in the Central Management Region participating in this annual survey. Also participating are Minnesota, Wisconsin, Michigan, Illinois, and Ohio; and Ontario and Manitoba.

Between April 10 and May 5, 2014, six woodcock were heard on four of 15 routes, compared to three birds on three of 18 routes in 2013. The number of woodcock heard displaying on the 2014 singing-ground survey, up 2.9%, did not differ significantly from the previous year for Indiana, but declined by 7.3% across

the Central Management Region (408 routes). Indiana has a breeding population index of 0.21 singing males per route. Based on the long-term trend estimates, the number of woodcock heard in Indiana has declined by 4.0% per year over the last 10 years (2004–2014), and by a significant 4.1% per year from 1968–2014. These declines are considerably greater than the 1.2% and 0.90% annual decline estimated for the entire Central Management Region over the respective time periods.

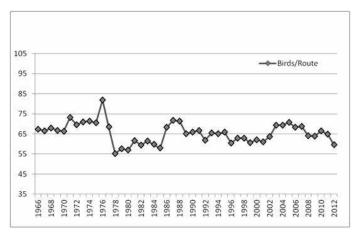
A total of 1,146 hunters from states with a woodcock hunting season sent in 13,363 usable woodcock wings in 2013. In the Central Region, the recruitment index (1.5 juveniles per adult female) was 7.2 % less than the 2012 index (1.7) and 1.4% less than the long-term regional average (1.6). Indiana's long-term recruitment index is 2.2 juveniles per adult female, 41.0% higher than the regional long-term index. Based on the HIP data, an estimated 700 Indiana hunters harvested 1,400 woodcock in 2013.

Like other upland game birds in Indiana, the number of American woodcock has declined over the last three decades. American woodcock habitat, usually associated with forest manipulation, is characterized as young, densely growing hardwoods within areas of moist soil. These moist soil areas must support ample populations of earthworms, the woodcock's primary food. Unfortunately, a lack of timber harvest on public and private lands and intense farming have decreased available habitat. Without habitat conservation and forest manipulation such as logging and prescribed fire, early successional habitats will continue to be lost and populations of American woodcock will continue to decline.

#### **Mourning Dove Population Status**

The mourning dove (Zenaida macroura) is one of the most widely distributed and abundant birds in North America and has a well-deserved reputation as a challenging game bird. Mourning doves are the most abundant upland game bird in Indiana.

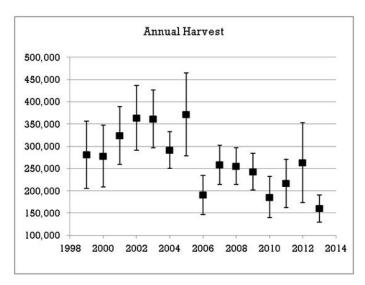
Mourning dove populations are monitored and managed by the USFWS in three management units: the East-



Mourning dove breeding bird survey (BBS) population index (birds per survey route) from 1996 to 2012.



A mourning dove being banded at the Indianapolis International Airport.



Estimated annual hunter harvest for mourning dove from 1999 to 2013 based on data from the Harvest Information Program (HIP).

ern, Central, and Western management units. Indiana is one of 27 states in the Eastern Management Unit (EMU). Indiana is one of 19 states within the EMU that permits dove hunting.

Indiana and other states within the dove management units assist the USFWS in collecting data annually. The DFW has cooperated with the USFWS on the Mourning Dove Call-Count Survey since 1966 (discontinued in 2013), the Dove Banding Program since 2004, and the HIP since 1999. The data are used to assess trends in annual population estimates, survival and recruitment rates, and harvest rates.

The available trend data from the Breeding Bird Survey (BBS) shows populations in Indiana are unchanged over the last 10-year period and over the long-term study (1966–2013). These results signify that Indiana's population is healthy and the state's current regulations and management approaches are appropriate.

Between July 1 and August 15, 2014, personnel banded 685 adult and 552 juvenile birds. Based on the banding data from 2003–2013, annual survival of juvenile and adult birds in Indiana is 36% and 38%, respectively.

Based on the HIP data, an estimated 7,700 hunters harvested approximately 160,100 doves in 2013. These harvest numbers were below expectations most likely because of extremely hot temperatures and poor sunflower production on areas that provided dove hunting opportunities.

### Northern Bobwhite—Effects of Disturbance and Macro-habitat Composition on Northern Bobwhite Movement, Dispersal and Survival

The Northern bobwhite quail is one of the most researched birds in North America. Wildlife agencies use research to understand what is affecting the bobwhite population as it continues a long-term decline in Indiana and across its range.

Since 2010, DFW farmland game staff captured bobwhites, banded them with aluminum leg bands and radio-marked them with necklace-style VHF transmitters to examine the effects of disturbance and habitat on bobwhite movement and survival on public land,



Northern bobwhite cock being removed from a mist-net by biologist Budd Veverka after some of the birds were flushed into the net by research staff.



Northern bobwhite hen captured in a modified Stoddard funnel trap at Glendale FWA.

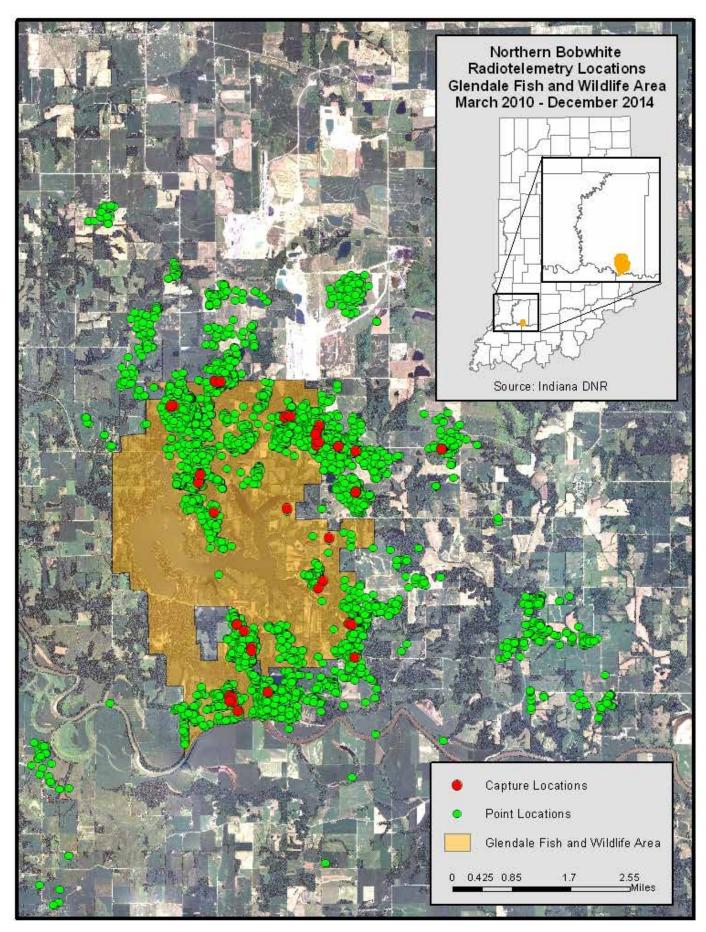
specifically Glendale FWA in Daviess County. Most bobwhites were captured in modified Stoddard walkin funnel traps baited with cracked corn, but some birds were captured with mist nets as birds either were flushed into the net or flew to an electronic call placed behind the net.

Over the five-year project, staff tracked 150 Northern bobwhites twice weekly in the non-breeding season, and daily in the breeding season, for a total of 7,492 locations. In 2014, three seasonal naturalist aides, Erica Skorlinski, Tessa Sullivan and Jamie Brown, completed the field portion of the study. Now, analyzing data, interpreting the results and publishing the finding begins. Naturalist aide Olivia Leonard has begun work in the ESRI ArcMap 10.2 program to determine home range, survival and habitat use. She also will begin working with researchers at Purdue University to model the data through their Simulations of Disturbance Activities (SODA) to examine the effects of disturbance on bobwhite behavior and survival. Results and publications of this research are expected by the end of 2015.

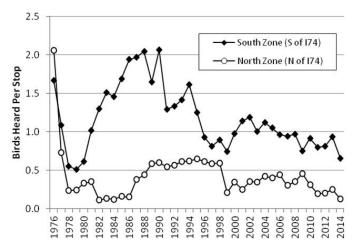
#### **Northern Bobwhite Whistle Count Survey**

The Northern bobwhite quail is widely distributed throughout eastern North America and Mexico and is one of the most important game birds in the southern and midwestern United States. In Indiana, there are approximately 11,000 quail hunters who annually harvest nearly 20,000 birds. To monitor changes in the bird's annual abundance, the Indiana DFW conducts roadside counts of whistling male bobwhites each spring. Survey results are used to formulate management priorities, set harvest regulations and evaluate habitat improvement programs.

In 2014, researchers counted 471 whistling bobwhites along 79 routes. Data were only included in the analysis if routes were surveyed in both 2013 and 2014, and at



All of the capture locations and locations of each radio-marked bobwhite recorded from 2010 to 2014 on and around Glendale FWA in Daviess County. Most recorded locations occurred between January and August.



Long-term trends for the bobwhite whistle count survey, separated by the two state hunting zones, south and north of Interstate 74.

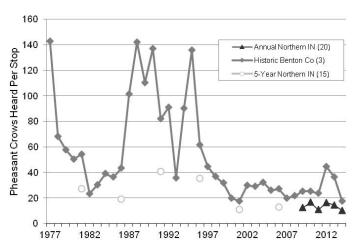
least one quail was recorded in those years. Considering only these 70 routes, the statewide average number of bobwhites heard per survey route in 2014 was 6.7 plus-or-minus 0.3 birds and was significantly lower than the 10.2 plus-or-minus 0.4 birds heard in 2013. When we examined hunting zones in Indiana, we observed significant declines in both zones but much greater declines in the north zone (south: -29.7%; north: -52.2%).

The harsh winter of 2013–14 likely had a significant effect on the quail population. The effect was more dramatic in the northern zone, which holds small and isolated quail populations and continues to lose early successional quail habitat. Good summer nesting conditions may help the population rebound a bit, but habitat loss, particularly the loss of winter cover, will continue to keep the population down and will enhance the negative effects of predation and weather events. The Northern bobwhite population in Indiana has been declining for more than 20 years.

Indiana landowners interested in creating bobwhite habitat can take advantage of federal and state habitat conservation programs. For more information, contact your local USDA service center (www.in.nrcs.usda.gov), or contact your local district wildlife biologist (wildlife. IN.gov/2716.htm).

#### Ring-Necked Pheasant Crowing Count

The colorful ring-necked pheasant (*Phasianus colchicus*) is a well-known game bird of Indiana and the Midwest. This naturalized species was introduced from China to Oregon in 1881. Indiana stocked ring-necked pheasants from the early to mid-1900s. After finding a niche in the agricultural landscape of the northern and central part of the state, the ring-necked pheasant has remained an upland game species sought by Hoosier hunters. The DFW conducts annual research on ring-necked pheasant. The findings are used to set management priorities and harvest regulations.



Long-term trend for the pheasant crowing count survey showing the current northern Indiana survey, historic Benton County routes, and the discontinued northern Indiana survey that occurred every five years.

The spring pheasant calling count survey has been conducted annually across the pheasant's range in some form since 1976. The survey was modified in 2009 from two small, less-frequent surveys to the yearly study. Today's survey provides an annual index of the pheasant population.

In 2014, 183 cock pheasant calls were heard at 360 stops along 18 routes. Data were included in the analysis only if routes were surveyed in both 2013 and 2014, and at least one pheasant crow was recorded each of those years. Considering only these 16 routes, the statewide average number of pheasant calls heard per survey route in 2014 was 11.4 calls. The change was a decrease of a significant 39.7% from the 18.0 calls heard in 2013. Even more dramatic than the statewide figure, the three historic routes in Benton County showed a significant decline of 51.6% in the number of pheasant calls heard per route in 2014. The figures showed 17.7 calls. The number in 2013 was 36.5 calls. Although this was 36.0% lower than the 10year average of 27.6 calls, the difference is not great enough to be significant.

The severity of the 2013–14 winter had a significant effect on the population, combined with habitat loss that occurred in some key portions of Benton County. Additionally, the state continued to lose Conservation Reserve Program (CRP) acres across the entire pheasant range. The continued loss of winter cover with fallow grass and fencerow removal left birds vulnerable to predation and severe weather. The overall long-term decline in Indiana's ring-necked pheasant population is primarily due to the loss of suitable habitat for wintering, nesting and brooding young.

Indiana landowners who want to participate in federal and state habitat conservation programs for pheasant can contact their local USDA service center (www.in.nrcs.usda.gov) or local district wildlife biologist (http://www.IN.gov/dnr/fishwild/2716.htm).

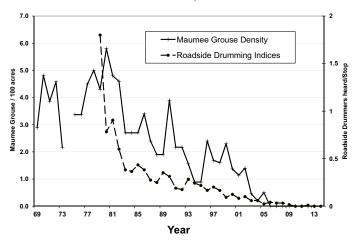
#### **Ruffed Grouse Population Status**

Trends in Indiana's ruffed grouse (Bonasa umbellus monticola) population have been continuously monitored since the late 1960s. The state's population peaked in 1980. It has declined ever since. Sufficient suitable early successional and young forest habitats of significant size and distribution no longer exist to sustain ruffed grouse throughout its former and current Indiana range. No drumming male ruffed grouse were heard on the 14 roadside survey routes (15 stops/route) during the 2014 survey for the second consecutive year. The five-year (2010–14) mean drumming index for the control routes was 0.002 drummers per stop (approximately one drummer heard every 500 stops) compared to 1.16 drummers per stop during the peak years of 1979-80. That is nearly a 600-fold decrease. Currently, ruffed grouse are thought to exist in 15 of the 43 counties reported in 1983.

Prospects for population recovery of ruffed grouse are dismal given the continuous advancement of forest succession. Grouse population levels have likely dropped below minimal viable levels within most of their current range in Indiana. The species appears destined for extirpation unless intervention occurs. This could take the form of extensive timber harvests of sufficient intensity or of continuing sizable natural disturbances happening across the forested landscape to create early successional forest habitats.

Due to declining suitable forest habitat and no foreseeable substantial increase in the early successional forest on a more permanent basis, DFW has formally proposed to suspend ruffed grouse hunting. The proposal has been preliminarily adopted by the Indiana Natural Resource Commission. It is undergoing public comment and review, and, if approved, would take effect by fall 2015. The DFW continues to monitor changes in Indiana's renewable forest resources and their impacts on early successional forest wildlife.

#### **Indiana Grouse Population Trends**



Ruffed grouse populations have likely dropped below minimum viable population levels throughout most of the species' Indiana range.

#### **Waterfowl Banding**

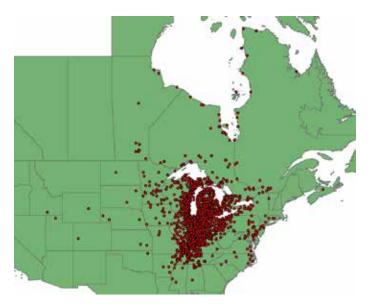
Canada geese and wood ducks (Aix sponsa) are migratory waterfowl that breed statewide in Indiana. Both are abundant and widely sought by waterfowl hunters.



Flightless Canada geese being coaxed into a funnel trap. (Photo by Deanna Lazowski)



A Canada goose with its new leg band. (Photo by Deanna Lazowski)



Harvest locations for Canada geese banded in Indiana. Indiana-banded (breeding) Canada geese have been barvested in at least 33 different states and provinces.

Each year the Indiana DNR captures and places aluminum leg bands on both species. Geese are captured during their flightless period in the last two weeks of June using funnel traps on dry land. Wood ducks are captured using baited live traps. The birds are removed from the trap, age and sex data are collected, and a uniquely numbered aluminum band is attached to one leg of each bird. Data from the banded birds are then submitted to the United States Geological Survey Bird Banding Laboratory in Maryland, which maintains the data from all banded migratory birds nationwide. Anyone who harvests, sees or finds a banded migratory bird is encouraged to report the band number by calling 1-800-327-BAND or by visiting www.reportband.gov. Information from the bird band recovery reports is used to calculate survival and harvest rates, and to determine movement patterns.

In 2014, a total of 1,874 Canada geese were banded on private and public lands in Indiana. An additional 471 geese were banded as they were relocated from nuisance situations to state FWAs. This exceeded the goal of 2,000 geese. Only 455 wood ducks were banded, well short of the annual goal of 1,285. This shortfall is likely the result of abundant water in summer 2014, which made concentrations of wood ducks difficult to locate and trap because ducks spread out when more water is available.

#### **Waterfowl Hunter Surveys**

Hunter surveys are valuable for assessing hunting effort and success, as well as hunter satisfaction, habits and approaches to hunting. The data assist DFW research biologists in setting seasons that address the biological parameters of the species hunted and the desires of the hunters who make conservation possible. The DFW sends a survey to waterfowl hunters every three to



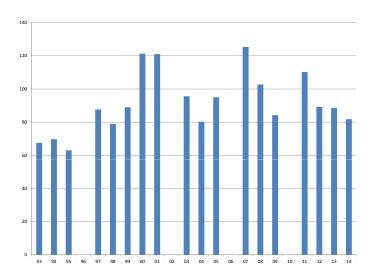
The opinions and preferences of waterfowl hunters are important considerations in setting hunting seasons. (Photo by Vicki Albietz)

four years. Surveyed hunters are randomly selected from the federal HIP database. Five-thousand resident hunters older than age 16 are selected from a pool of about 14,000 Indiana waterfowl hunters.

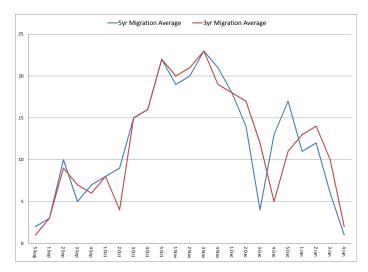
The most recent survey was sent after the 2013–14 season. DFW biologists are analyzing the survey responses and will produce a report before making recommendations for the 2015–16 waterfowl seasons.

#### **Waterfowl Population Surveys**

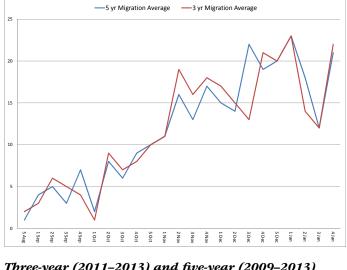
The DFW performs many waterfowl population surveys. During the April breeding season, statewide helicopter surveys estimate the breeding population of Canada geese, mallard (Anas platyrhynchos), blue-



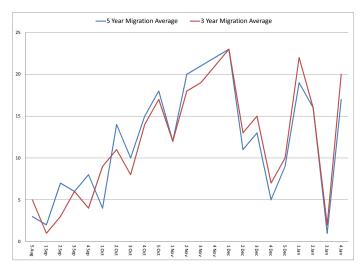
Yearly Indiana Canada goose breeding population estimates (in thousands). No population was estimated for 1996, 2002 and 2010. The estimate for 2006 was removed due to small sample size.



Three-year (2011–2013) and five-year (2009–2013) duck migration averages (in thousands) for the north waterfowl hunting zone. The x-axis represents the approximate week of the month, not the date.



Three-year (2011–2013) and five-year (2009–2013) duck migration averages (in thousands) for the south waterfowl hunting zone. The x-axis is the approximate week of the month, not the date.



Three-year (2011–2013) and five-year (2009–2013) duck migration averages (in thousands) for the central waterfowl bunting zone. The x-axis is the approximate week of the month, not the date.



Helicopter view of snow geese rising from the water at Gibson Generating Station.

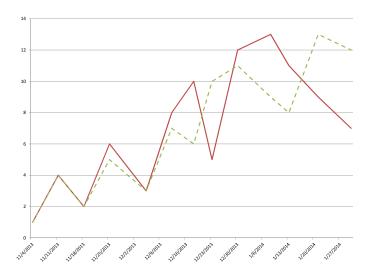
winged teal (*Anas discors*) and mute swan (*Cygnus olor*). Wood duck breeding populations are not estimated because they are difficult to survey from the air. This is because they nest in tree cavities and are not visible from a helicopter. Indiana breeding population estimates for 2014 were 81,842 Canada geese, 21,030 mallards and 3,110 blue-winged teal.

Since 1986, weekly waterfowl surveys have been conducted from the last week in August through the end of January on selected state and federal properties throughout Indiana. The data allow DNR to track yearly and long-range migration timing and distribution as birds move through the state. This information is useful for setting annual waterfowl season parameters in

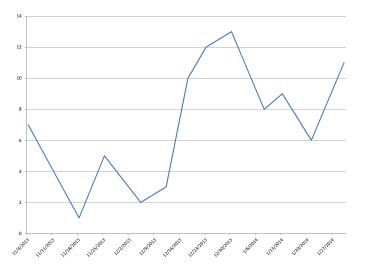
each waterfowl hunting zone to maximize local hunting opportunities while peak migration is occurring in each particular zone.

In 2012, the DFW began conducting weekly helicopter surveys on the lower Wabash, White and Ohio rivers from November through January. These flights provide information about winter waterfowl usage on Indiana's major river systems. The 2013–14 season was the second for the Wabash surveys and the first for the East Fork of the White River. Due to low waterfowl densities, surveys on the Ohio River were discontinued after the first year.

Helicopters fly the Wabash River from its confluence with the Ohio River up to the U.S. 40 bridge in Terre Haute. The West Fork White River is flown from the



Migration rank by week during the 2013-14 waterfowl survey (red solid line) and the two-year average (green dashed line) for the Wabash River. The survey occurs for 14 weeks. The week with the highest count has a rank of 14; the week with the lowest count has a rank of 1.



Migration rank by week during the 2013–14 waterfowl survey for the West Fork White River. The survey occurs for 14 weeks. The week with the highest count has a rank of 14; the week with the lowest count has a rank of 1.

State Road 39 bridge in Martinsville down to the S.R. 58 bridge, west of Elnora. The ditches and marshes around Gibson Generating Station (as well as Gibson Lake) and Cane Ridge Wildlife Management Area are also flown. This is an important area for wintering waterfowl, especially mallard, snow goose *(Chen caerulescens)*, and Ross's goose *(Chen rossii)*.

#### Wild Turkey Disease Monitoring

Each year, hunters and landowners harvest or just see wild turkeys that appear ill, either because of the birds' behavior or because they have external lesions. Sometimes the injury or possible pathology can be determined by looking at digital pictures or by gross physical

examination of the carcass. Sometimes freshly collected birds are sent for further testing to the ADDL at Purdue University. Ten birds were submitted in 2014. No significant pathologies were found.

From 2009–11, a significant outbreak of turkey corona virus occurred in a commercial turkey facility in Dubois County. Turkey houses in Daviess, Pike and Greene counties had isolated outbreaks. The last previous outbreak of turkey corona virus in Indiana was in 1995.

Because free-ranging wild turkeys live close to commercial turkey houses in southwest Indiana, wild turkeys harvested in that general area were tested for turkey corona virus from 2011-13. As part of this disease monitoring project, samples of hunter-harvested wild turkeys from various locations around the state also were tested. We collected serum samples from 246 wild turkeys and tested these for turkey coronavirus (TCV), Mycoplasma gallisepticum (MG), M. synoviae (MS), avian paramyxovirus-1 (APMV-1), and Bordetella avium (BA) from locations throughout the state. Out of 246 wild turkeys, we found one positive for TCV in the immediate area of a recent TCV outbreak in a commercial poultry facility. We found five birds positive for MS; seven birds positive for MG; and 168 birds positive for BA. Although 16 birds tested positive for APMV-1 at first, a subset of these samples was tested later at the National Wildlife Research Center. All of those samples tested negative.

In 2013, we also tested 1 MG and 3 MS. Given the relatively low titers (concentration of antibodies) of the test results, it is unclear what if any effect these diseases have on the statewide wild turkey population. Little work has been done to explore the biological significance of these diseases as to whether low prevalence of TCV, MG, MS and other diseases causes more mortality and reduces clutch sizes or hatch rates of wild turkeys.

Additional testing and research may be prudent in re-established wild turkey populations to determine what effect these diseases may ultimately be having on recruitment or influencing other forms of mortality. The complete findings of this study will be formally published in proceedings of the 11th National Wild Turkey Symposium in January 2015; J. Caudell, S.E. Backs, R. Rudolph, T. Hooper, T. Bryan, and D. Murphy. Surveillance of turkey corona virus and other infectious pathogens in Eastern wild turkey (Meleagris gallopavo) in Indiana.

#### Wild Turkey Harvest

Hunters harvested 615 wild turkeys during 2013 fall turkey season, five more birds than the 610 taken in the 2012 fall turkey season. The archery-only portions of the season accounted for 30% of the harvest. Shotgun hunters accounted for 59% of the harvest.

Weekends accounted for 45% of the total harvest, with 34% harvested during the weekends of the combined archery and shotgun portions. Juvenile birds made up 26% of the harvest with a juvenile-to-adult ratio of 1:2.8. This still relatively high proportion of adults in the fall

harvest likely reflects hunter selection for larger adult birds and age-determination errors.

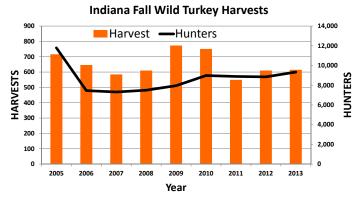
Counties harvesting at least 20 birds (≥ 3% of the total harvest) were Harrison (30), Crawford (27), Switzerland (25), Jefferson (24) and Warrick (20). The statewide fall-to-spring harvest proportion was 5%, due to the conservative season structure and relatively low hunter interest. The new Web-based CheckIN Game harvest reporting system accounted for 62% of harvest reports.

Hunters harvested 10,872 wild turkeys in 88 of the state's 92 counties during the 2014 spring wild turkey hunting season, based on reports from 367 check stations (57% of the harvest records), with the remaining 43% of the harvest records from CheckIN Game (42%) and tele-check (1%) systems that took effect in 2012. The 2014 harvest was 4% less than the 2013 harvest of 11,374. There were 17 counties with harvests ≥ 200 birds compared to 24 in 2013. Overall, 52 counties showed declines in harvests (-1 to -100%), three counties showed no change, and the harvests increased in 37 counties (1% to 167%).

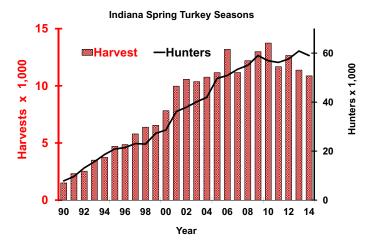
The top 10 counties were Switzerland (394), Harrison (363), Jefferson (360), Dearborn (313), Steuben (306), Perry (269), Franklin (268), Greene (260), Washington (248), with Clark (241) and Ripley (241) tied for 10th.

Approximately 57% of the regular-season harvest (9,676 birds; April 23 to May 11, 2014; 19 days) occurred during the first five days, with 47% occurring on the three weekends. A total of 1,185 birds (11% of total harvest) was taken during youth-only weekend (April 19-20), and 11 birds were taken during the Wounded Warrior hunt at Camp Atterbury prior to the regular season. Approximately 78% of the harvest occurred before noon, 5% happened from noon to 3 p.m. and 17% occurred from 3 p.m. to sunset. Landowners/active military personnel (both are license exempt) accounted for 8% of the harvest.

Juvenile gobblers (1-year-old birds called jakes) made up 17% of the 2014 spring harvest; 2-year-olds (53%) and 3-year-olds (30%). Mean weights were similar to those of previous years. Bearded hens made up 2% of the harvest. All regions showed net decreases in harvest except east-central Indiana, reflecting the overall 4%



Fall wild turkey barvest summary (2005-2013).



Spring wild turkey barvest summary (1990-2014).

decrease in the total harvest. The northern region, which is the largest region, supported 25% of the harvest, and 46% of the harvest occurred in the south-central and southeast regions.

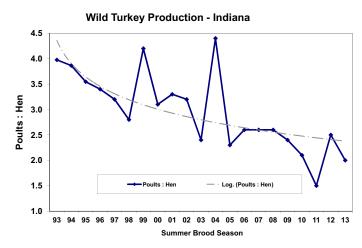
Reasons for the 4% decrease in 2014 were likely related to the continued low summer production over the last decade and possibly to what appeared to be roughly a general two-week delay in the onset of breeding season, perhaps as a result of the abnormally hard winter.

Annual harvest levels have been in a slight decline the last few years. The bird harvest levels the last two seasons have been below 12,000. The estimated number of hunters afield decreased slightly in 2014. Estimated hunter success was 18%, the lowest since 1986. The majority of the birds were harvested in the early part of the season during the early morning hours. The northern region, the largest region, supported 25% of the harvest. A combined 46% of the harvest occurred in the southcentral and southeast regions. The estimated number of hunters afield was 59,237 in 2014.

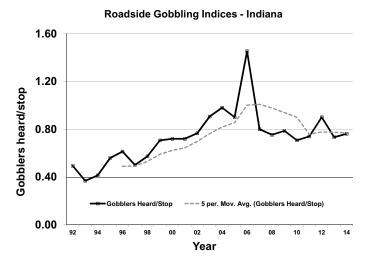
#### **Wild Turkey Population Status**

Trends in summer brood production continue to be of concern. This concern began in the post-restoration era, not only in Indiana, but also across the eastern United States.

Indiana district wildlife biologists and conservation officers record observations of wild turkey hens and poults during normal duty hours in July and August. In 2013, Indiana's statewide mean production index was 2.0 poults per adult hen (PI), with 20% fewer poults/adult hen and 13% fewer hens observed with broods, compared to 2012. The 2.0 PI was not significantly different from the confidence limits of the five-year mean of 2.2, but 2013 had the second-lowest PI since the survey began in 1993. Since then, the average PI has progressively declined. Climatically, the spring/early summer of 2013 had above-normal precipitation and below-normal temperatures. This marked the eighth consecutive year of flooding in various regions of the



Wild turkey mean summer brood production trends (1993-2013).



Wild turkey gobbling index trends (1992-2014).

state that are associated with the nesting and early brood rearing periods of June (e.g., 2013 in west-central, southwest, and southeast Indiana). Production data for 2014 have yet to be analyzed.

Each year (late March to April) DFW personnel drive predetermined routes (10 routes; 14 counties; 15 stops per route) and listen for gobbling turkeys and drumming ruffed grouse. The amount and level of gobbling activity is related to the proportion of 2-year-old males (the most-active gobblers) in the population. Therefore, the number of turkeys heard per stop in any given year generally reflects the level of nesting success two years ago. Because of the variability of gobbling activity related to the proportion of 2-year-old males and prevailing weather, trends in gobbling indices are generally assessed every five years.

In 2014, the number of male wild turkeys heard gobbling along the traditional 10 control roadside routes surveyed April 1 through 28 was 0.69 gobblers heard per stop, the same as in 2013. Four routes were reestablished in 2012 to expand the statewide coverage.

Overall, the statewide gobbling index for the 14 routes was 0.95. That finding represented a 12% increase over the 0.85 figure recorded in 2013. The long-term trend, based on a five-year moving average for the 10 traditional routes, shows a general increase from 1987–2006, followed by a general decrease after the 2006 peak. The 2014 gobbling index of 0.76 did not differ significantly from the five-year mean. This was likely due to the addition of values from the four routes added in 2012.

# WILD PIGS Wild Pig Status

Indiana's wild pigs (Sus scrofa) are an exotic, invasive species intentionally and illegally released in two different regions of the southern part of the state in the early 1990s. Recent DNA work has verified their suspected primary link to sources in Louisiana and possibly Mississippi. The DNA work also suggests other sources of pigs that were likely released several years later. Morphologically, those wild pigs exhibited characteristics of "Eurasian or Russian Boar" hybrids and not feral swine of domestic origin.

DNA profiling of existing wild pig populations shows promise as a forensic tool for law enforcement to determine the origin of potential new populations, and as a means to evaluate eradication success.

Population control is done primarily through unrestricted shooting, but in the last five years the DFW and USDA Wildlife Services have used traditional trapping and snaring methods to capture and help control wild pig populations on the property of cooperating landowners.

In 2009, a third population of free-ranging swine in east-central Indiana on the Ohio border was linked to a licensed shooting preserve that closed around 2006. Records indicate the shooting preserve legally imported more than 300 Eurasian or Russian wild pigs from Canada and Ohio during its six prior years of operation. Unrestricted shooting appears to have reduced this population. The DFW no longer receives reports from the area but its wild pig population's status is uncertain.

The number of pot-bellied pig reports around the state has increased. This proliferation has become more of an administrative nuisance and unnecessary waste of limited personnel investigation time than it already was. Most pot-bellied pigs and their hybrids appear to be former pets that were abandoned, escaped or were poorly confined. Those and other free-ranging swine of all types can generally be shot on sight in Indiana with landowner permission. Several pot-bellied hybrids have been killed on DNR properties.

The use of trapping and snaring capture methods in the Midwest has involved meeting the challenges of adapting techniques and equipment traditionally used in many Southern states to this region's different conditions. The conditions include relatively low-level pig populations, abundant food resources and winter conditions. The challenge is training landowners to use multiple control methods and develop the patience to

capture complete pig groups of adult sows and their progeny for removal.

The DFW has also dealt with several equipment failures involving commercially available trapping and snaring equipment, especially during winter. Indiana has recently modified its exotic animal statute to recognize the legal possession and breeding of "Heritage" swine and is also proposing prohibiting the pursuit or take of wild/feral swine with dogs as well as adding language pertaining to "aiding and abetting" the illegal release of wild/feral swine.

Development of DNA profiles of wild pigs both locally and nationally will provide useful tools to evaluate eradication efforts, identify source populations, and assist in the successful prosecution of illegal release activities. The DFW and USDA Wildlife Services collected tissue samples from 80 wild pigs occurring in nine counties in Indiana and processed them for a panel of 14 microsatellite loci. We compared microsatellite genotypes for pigs from Indiana to those previously identified for 217 wild pigs in 28 other continual states using Bayesian cluster-

ing techniques. We identified putative origins for pigs introduced to Indiana based on molecular population structure and individual genotype relationships. We integrated this information with what we know or thought we knew about the origins of feral swine in Indiana through oral history and other documentation.

Analyses revealed links to Eurasian wild boar through associations with known hybrid populations in other states and within Indiana. This finding supports suspected modes of introduction and phenotypic characteristics observed for wild pigs in Indiana. It also suggests that molecular techniques are a viable tool for explaining introduction histories; however, we also found that the oral history was a critical component for understanding the results.

Results of this study were formally presented at the Proceedings of the 15th Wildlife Damage Management Conference and the 74th Midwest Fish and Wildlife Conference in Kansas City, Missouri in January 2014; Identification of Putative Origins of Introduced Pigs in Indiana Using Nuclear Microsatellite Markers and Oral History by J. N. Caudell, B. E. McCann, S. E. Backs.



Photographed using a trail camera, a feral sow cools off in a wallow on farmland near Bedford. Feral pigs rely on mud wallows for cooling because they do not have sweat glands. Feral pigs also use wallows to control parasites on their skin. They frequently rub the mud off their bodies onto small trees.